Making Healthy Choices Easy Choices – Taking Tasmanian Primary School Children on Their Own Food Journey

by

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Abbreviations

Abbreviation	Description
ABS	Australian Bureau of Statistics
ADG	Australian Dietary Guidelines
AGTHE	Australian Guide to Healthy Eating
AHS	Australian Health Survey
AI	Average Intakes
AR	Action Research
BMI	Body Mass Index
CA	Content Analysis
CAP	Canteen Accreditation Program
CCA	Conventional Content Analysis
CINAHL	Cumulative Index to Nursing Allied Health Literature
COPD	Chronic Obstructive Pulmonary Disease
DAA	Dietitians Association of Australia
DHHS	Department of Health and Human Services
DOR	Division Of Responsibility
EAR	Estimated Average Requirements

FAO	Food and Agricultural Organization of the United Nations
FTT	Failure To Thrive
GCPH	Glasgow Centre for Population Health
IF	Impact Factor
JCR	Journal Citation Reports
MEDEL	Måltiden – En DEL I Lärandet Project (The meal - part of the Learning Project)
MJ	Mega Joule
MWEW	Move Well Eat Well
NCDs	Non-Communicable Disease
NHSC	National Guidelines For Healthy Food and Drinks Supplied in School Canteens
NRV	Nutrient Reference Values
NSECHR	National Statement on Ethical Conduct in Human Research
PAR	Participatory Action Research
PBC	Perceived Behavioural Control
PHN	Public Health Nutrition
PI	Primary Investigator
PPR	Perceived Parental Restriction
PROP	6-N-Propylthiouracil
RDI	Recommended Daily Intakes
SCT	Social Cognitive Theory
SEIFA	Socio-Economic Index For Areas
SEM	Socio-Ecological Model
SJR	Scimago Journal Ranking
SS HREC	Social Science Human Research Ethics Committee
TCSA	Tasmanian School Canteen Association
TPB	Theory of Planned Behaviour
UN	United Nation
UTAS	University of Tasmania
WHO	World Health Organisation

Abstract

Introduction - Most Australians, including children, are not eating a healthy diet according to the Australian Dietary Guidelines (ADG). Only two per cent of children are eating the recommended daily serves of vegetables and fruit, and nearly half of their daily intake comes from nutrient- poor and over-processed food. The prevalence and early onset of chronic disease are increasing globally. Currently in Australia, 90 per cent of deaths are attributable to chronic disease. Healthy eating habits are key protective factors for many common chronic diseases such as obesity, type 2 diabetes and heart disease. Finding new ways to establish healthy eating habits in children is imperative to promote wellness and provide protection against chronic disease later in life. Yet, it remains unclear how to increase the number of children eating according to the ADGs and how to support children to establish healthy eating habits that persist into adulthood.

There is an international consensus that some aspects of a whole-of-school approach have resulted in significant yet moderate improvements to healthy food available to children and their food choices. The question is, what strategies will have a bigger impact on children's food choices during school. Researchers have underscored the importance of incorporating the views of children in planning health promotion programs within the school setting; however, research that puts the direct views of children about their intake at the centre of inquiry is limited.

Incorporating the views of children not only provides children with ownership of programs targeted at them, it provides an accurate account of factors that influence children's eating behaviours. In the limited research that has worked directly with children, adult perceptions about why children make food choice is not the same as what children think. To effectively improve children's eating behaviours, it makes sense to base interventions on factors that will influence food choice as reported by children.

Currently, there is a gap in knowledge about the decision-making criteria that children use to make food choices and what influences these choices. Research that asks children directly why they make the food choices they do is limited. The literature available suggests that adults are making assumptions about why children are making particular food choices. To improve the understanding of children's decision-making criteria, more research that asks children themselves about their views on food choice is required.

Aim - The aim of this study was to investigate the decision-making criteria that children use to make food choices in a primary school setting using a Participatory Action Research (PAR) method.

Methodology - A qualitative, inductive and participatory approach guided the research using PAR. This methodology has been reported as an appropriate research approach when working with children and schools because PAR can act as a conduit to make improvements with the school environment, as well as understand what is happening amongst participants. The study received a full ethics approval (number H0012935) through the University of Tasmania Social Science Human Research Ethics Committee (SS HREC).

A convenience sample of students from a non-government primary school in Tasmania was used to complete five PAR cycles. Data were collected from children on five occasions using; an open class discussion (n=80), a day in the canteen (all grades), a specified meal for the day (grades two - six) and two Discovery Days with grades two - six (n=100). The Discovery Days were designed to provide a platform for children to work in groups of mixed grades to address a creative brief in an open classroom, with no input from the teachers. On each Discovery Day, children were instructed to create a menu for their canteen. As a group, they recorded the reasons why they chose particular foods. Groups of children were filmed during the day and were asked to share why they chose the foods on the menu. Answers from open-ended questions were documented on an Excel spreadsheet. Data were analysed using descriptive statistics and conventional content analysis.

Methods - Five action cycles were completed and on a conceptual level the action cycles were an interconnected matrix. Action Cycle 1 led to Action Cycle 2 and 3 simultaneously. The reflection of Action Cycle 2 and 3 led to Action Cycle 4 and 5. Data revealed that most children regularly used the canteen. Despite the availability of healthy foods on the canteen menu, the foods most often purchased were unhealthy. Children also created menus on each Discovery Day that were predominantly unhealthy foods. A conventional content analysis resulted in a series of codes and thirty-one categories across both Discovery Days. From the categories, five themes emerged on Discovery Day one and six themes emerged on Discovery Day two. The emerging themes from different action cycles were considered collectively to develop theoretical concepts.

Findings - The conceptualisation process resulted in six theoretical concepts. Five concepts that were formed from the children's perspectives appeared to influence their food choice: pleasure, popularity, eating context, versatility and texture. A sixth concept (knowledge) did not influence their food choices. To translate the complexities and integrate 'what was known' with 'what was found', the results of the study informed the development of a model that can be used by schools to plan health promotion initiatives. The model can be used to explain the theoretical research findings in a format that is easy to understand and will enable translation of this research into practice.

Conclusion - This study has found that children are key informants because they were able to articulate their decision-making criteria for food choice. Their criteria informed the development of a practical model that can be used to guide public health interventions and nutrition-related policy in the school setting. It is known that for a paradigm shift to occur for healthy eating in schools, health professionals, school communities and government need to consistently convey the same healthy food messages. The practical model developed in this research strengthens the current approach to health promotion in schools by seeking to make healthy options more desirable to children. The model developed also represents the complexities of promoting healthy eating to schoolchildren and can serve as a consistent guide for all sectors that address healthy eating in schools.

Statement of Original Authorship

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university or other institution and affirms that to the best of my knowledge, the thesis contains no material previously published or written by another person, except where due reference is made in the text of this thesis.

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Statement of Authority

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Statement of Ethical Conduct

The research associated with this thesis abides by the international and Australian codes on human and animal experimentation, the guidelines by the Australian Government's Office of the Gene Technology Regulator and the rulings of the Safety, Ethics and Institutional Biosafety Committees of the University.

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Prologue

The thesis that follows is for a Professional Doctorate completed at the University of Tasmania. The purpose of the section to introduce myself and to explain how the project came about. With an understanding of my background, I hope the context of the study is clear from the beginning.

I completed my Masters in Public Health in 2008 and I have been recognised as a leader in nutrition through the Dietitians Association of Australia with an Advanced Accredited Practising Dietitian status since 2011. I currently live in Hobart with my husband and two sons. The relevance of mentioning my family is because after my sons were born I was 10 years into my profession but I began to question everything about teaching healthy eating habits to our young children. In my new role as a parent, I started to learn how complex children's eating habits really are.

I have gained experience in various areas of nutrition and dietetics over the last 20 years including; clinical, sports, private practice, food service, policy development, project management, community nutrition and public health nutrition. For 17 of those years I worked with the Community Nutrition Unit, Department of Health and Human Services (DHHS), Tasmania. In this role, while diverse, my priority areas were healthy workplaces and childhood nutrition. I was fortunate to commence my Professional Doctorate in this role but I resigned from the DHHS in 2014 and took on an academic role within the School of Health Science, at the University of Tasmania.

After many years of developing a passion for childhood nutrition, formative research and evaluation, my axiological stance continues to evolve. Some general statements to represent my current thinking are:

- The role of children as change agents to improve their eating behaviour is understated.
- Why children make the food choices they do must be explored with children directly. This approach has the potential to revolutionise dietary habits amongst this age group.

- It is possible that children could be the key to changing naturalistic assumptions around food.
- Evidence-based guidelines about what food constitute a healthy diet, guidelines about healthy food options and programs to create a healthy food environment at school are integral to supporting healthy eating behaviours. Nevertheless, these guidelines must influence what healthy food children purchase. Even if adults decide what to put in their child's lunchbox or order from the canteen, the child ultimately chooses whether they eat the food. Our strategies need to be effective for creating healthy food environments, positively influencing the purchase of healthy food and the children need to consume the healthy food. Currently, though important, the main focus is on the aspect of availability. Intrinsically, it should be about availability plus purchase plus consumption.
- It appears that adults may have misinterpreted what drives children to make particular food choices. My experience as a dietitian and a parent led to my belief that by improving our understanding of why children make the food choice they do, the development of interventions, supportive environments and healthy policy are better informed and likely to be more effective.

Dunleavy (1) acknowledges that doctoral projects are closely bound to a student's personal identity. Doctoral students experience an exponential leap in their learning as a researcher, a scholar and an author of an extended piece of writing. This experience magnifies with professional doctorates who are already established in their profession. As a professional dietitian and postgraduate student, I reflected on how this would influence the methodological decision in selecting the research strategy.

As I mentioned at the start, my professional background as a dietitian and personal experiences as a parent of young children, will have exerted a level of influence on this research at all stages. This brings forward the concept of reflexivity as described by Alvesson and Skoldberg (2), where one is bound to the topic. The difficulty for students to practice self-awareness and have the ability to view their research through a critical lens is also recognised by Dunleavy (1). I have explored this further in the methodology acknowledging my role at times as an observer.

As the thesis progressed, I have reflected on the influence my background, experiences and preferences had on the research philosophy, research design, analysis and interpretation. This self-analysis or epistemic reflexivity has allowed me to consider the degree of influence I may have exerted to shape this research. In an effort to maintain a focus on the research findings in my discussion and conclusions, I wrote a post-script to separate my professional reflection of the research.

I am passionate about finding ways to have a bigger impact on the establishment of healthy eating habits in our young generation. I believe children can provide valuable insights into ways that we can make healthy food desirable to children, which will positively influence their eating habits going into adulthood. Several pieces of promising research that report effective outcomes for changing children's eating habits, are internationally based. I believe that using the school setting as a research platform can result in the discovery of new information that can assist those working with primary school children. I envisage that my research will add to current approaches, and over time contribute to improving eating behaviour outcomes.

CHAPTER 1 INTRODUCTION TO THE STUDY

Healthy human development is key to a healthy society, which has personal, social and economic benefits to people, their families and communities as a whole (3-6). Political, ethical, social and economic factors influence health and in turn, poor health threatens social and economic growth (3, 5, 7, 8). Individuals living with good health have the chance for further education and less illness. Consequently, good health leads to improved productivity and a reduced burden on the health care system, families, employers and the economy (5, 7-9). Globally, health professionals recognise the value of improving the health of populations and acknowledge the crucial role of a quality nutrition landscape to achieve healthy societies (9-11).

The global momentum for improving nutrition was revitalised and described in key World Health Organisation (WHO) and United Nations (UN) documents including; the Rome Declaration on Nutrition 2014; UN Decade of Action on Nutrition 2016-2025; Transforming our World: 2030 Agenda for Sustainable Development; Ambition and Action in Nutrition 2016-2025; and Montevideo Roadmap 2018-2030 on Non-Communicable Diseases (NCDs). The shared vision of such action is to have “a world free from all forms of malnutrition where all people achieve health and well-being” (10). The statement ‘all forms of malnutrition’ recognises that a deficit in essential nutrients can result in underweight, overweight, obesity, deficiency disease and diet-related NCDs (10-12). Some of these key documents have nutrition-related targets or strategies specific to children (9-11). Childhood nutrition is the focus of the research presented in this thesis.

This introduction chapter will describe the current global health crisis related to unhealthy eating and the role of diet in improving health. Furthermore, this chapter will introduce healthy eating in the context of the whole population and then primary schools, before introducing the project school and participant information. A discussion regarding behavioural models commonly used in the nutrition research will set the tone for this research project. Finally, a synopsis of each chapter is presented.

1.1 Population health perspective

Poor health leads to chronic disease, also referred to as Non Communicable Diseases (NCDs) (10, 13, 14). While there is some variation in the definition, both terms refer to a disease that lasts six months or more, is complex and has some aspects of preventability (7, 8, 13, 15). For the purpose of this thesis, this group of diseases is referred to as NCDs, unless reporting specific information from a source that use the term chronic disease. Conditions of this type include coronary heart disease, stroke (collectively known as cardiovascular disease), type II diabetes, cancer, and chronic obstructive pulmonary disease (COPD) (4, 13, 14). NCDs have superseded communicable disease as the leading cause of illness, morbidity and mortality (known as burden of disease) worldwide (4, 7, 11, 13). In Australia, the last two *Australian Health Surveys* established that NCDs accounted for 80-90 per cent of Australian deaths (7, 14). In Australia, the four most expensive disease groups, which cost 27 billion dollars in 2008-09, were all NCDs (7). The global cost of NCDs is expected to be 47 trillion dollars between 2011 and 2030 (8).

Most NCDs are preventable and linked to an unhealthy lifestyle, including poor diet (7, 8, 13). Other common NCDs risk factors include tobacco use, excess alcohol and physical inactivity (4, 7, 8). On a global scale, deaths from NCDs have risen from 57 per cent of all deaths in 1990 to 65 per cent in 2010 (4, 8). This figure is predicted to rise by the year 2030 to 70 per cent (8). The WHO advocates for evidence-based public health practices to prevent the rise of chronic conditions (11, 12). The leading NCDs causing death globally, and in Australia, include cardiovascular disease, cancer, chronic obstructive pulmonary disease and diabetes (7, 8).

The most pronounced contributor to protection against NCDs and health promotion is healthy eating, which describes a diet containing a regular and consistent intake of essential nutrients with limited amounts of nutrient poor choices (4, 7, 8, 15-17). Key health professionals and associations, including the peak Australian body for nutrition (Dietitians Association of Australia), developed the Australian Dietary Guidelines (ADG) for the Australian Government, (16). The ADGs are evidence-based guidelines that support health promotion and disease prevention across the population through healthy eating and maximising the intake of highly nutritious foods (16).

Most Australians, including children, are not eating in accordance with the ADG (14). Specifically, children eat well below the recommendations for daily vegetable and fruit intake (14). Inversely, the intake of total energy from foods with poor nutritional quality exceeds the ADG recommendations (18, 19). It is widely acknowledged by many professional bodies - including health departments, health professionals and teachers - that there is a need to improve healthy eating amongst children (5, 10, 14).

A healthy diet in young children is essential to optimise their growth and cognitive development, and reduce their risk of developing chronic conditions, including overweight and obesity, throughout their life span (16, 17, 20, 21). Healthy eating habits established early in life persist into adulthood and are crucial for the health of children now and into their future (10, 16, 17, 22, 23). Childhood nutrition is at the core of human progress and a vital public health issue globally (17, 24) as reflected by the high number of nutrition strategies targeted at children in international documents focused on health promotion (5, 10, 11).

A healthy food environment in the school setting is well placed to provide consistent health messages and foster healthy eating habits because schools are central to maximising children's education levels and children spend a significant amount of their weekday at school (5). From a population perspective, the school setting is an opportunity for promoting healthy eating to Australian children because attendance is mandatory (22, 25, 26). The school canteen can influence a food environment in a positive or negative way (27, 28). Within the context of a healthy food environment, it is important to provide choice to enable a habit to form (29-31). Food restriction or complete parental authority over foods can have a negative effect on children's eating habits long-term (29, 32). The essence of this thesis is to explore opportunities to reverse current diet-related disease trends by concentrating on improving our understanding of what motivates children to make food choices. The long-term vision of the researcher is to use children as key informants to understand why children make the food choices they do in order to establish healthy eating habits in our younger generation.

Despite the global strategic direction from the WHO, Australian evidence-based guidelines and health promotion programs that have been in available for several years, children in Australia are still not eating a healthy diet (5, 14, 17, 33, 34). With this in mind, the researchers sought to engage with children from a primary school in Tasmania to investigate and understand why children make particular food choices, and what influences these food choices. The research placed students at the centre of inquiry about improving food choices within a school food environment. While this study is conducted in Australia's small island state, Tasmania, it is anticipated that outcomes of this study will contribute to the wider body of knowledge on children's food choices.

1.2 Background

In my role as an Advanced Accredited Practising Dietitian, there have been numerous discussions with teachers and parents concerning what food children consume at school. The opportunity to investigate and explore these concerns developed when a local primary school proposed an initiative focused on improving healthy food messages and food choices within their canteen. Upon meeting the principal, three teachers and a parent, it became apparent that adults were recounting their own versions about children's food choices instead of asking the children. I began to reflect on strategies that intended to improve eating habits among children and conducted a preliminary search of the literature. Through my professional experience and reading literature on the matter, it was evident that most interventions targeting children did not ask children why they make food choices.

There is literature available that focuses on what children choose and what barriers exist to eating healthy food (27, 35) but not an understanding about the decision-making processes children use to decide whether they will choose particular food. I became interested in the notion that adults have been creating healthy eating interventions for children based on an adult interpretation of why children make food choices, rather than basing it on what children themselves report. In a second meeting, it became apparent to the teachers and parents that the stakeholders, the children themselves, were not asked about why they made food choices.

The school committed to exploring this question further and agreed to take part in the research as part of this Professional Doctorate. The school principal, three teachers and one parent formed part of the project team. In line with a Participatory Action Research (PAR) approach, we were all researchers; the teachers and parents were integral in the planning, data collection and reflective processes of each action cycle. I facilitated the research, collated and analysed the data, reported to the group and documented the research. The project team initially wanted to create a menu that matched healthy eating guidelines and decision-making criteria that children reported. As the research progressed, it was apparent that the study would be more exploratory rather than directly effecting change. The project team were in agreement about this development. Such an iterative, yet cooperative process is in accordance with a PAR approach.

1.2.1 Tasmanian context

During the year of data collection (2012/2013), the Tasmanian population made up 2.3 per cent of the 23 million people who resided in Australia. This equates to approximately 529 000 people (7). Geographically, the island of Tasmania is unique. Tasmania represents a mixed demographic across regional and remote areas within the island boundary. Relative to other areas of Australia, the population numbers and area size are small. These attributes and the close links with the community and health professionals, make it an ideal location for evaluating interventions, plus trialling and developing effective strategies to improve the health of the Australian population.

The two main childhood public health programs operating in Tasmanian primary schools at the time of this research included Move Well Eat Well (MWEW) (36) and the Tasmanian School Canteen Association's (TSCA) Cool Canteen Accreditation Program (CAP) (37). In 2016, the Tasmanian government released a new strategy, "Healthy Tasmania – five year strategic plan" that focus on the following priorities for action; smoking, healthy eating and physical activity, community connections, and chronic condition screening and management (38).

1.2.2 Potential benefits of the study

The possible benefits for teachers and students include being empowered through involvement in a project to create a healthy food environment at school. Another way this research empowered students and teachers on the project team was providing an avenue for them to express their views. As described in the rationale, there are several health benefits to the participants if the ultimate outcome is to find a way to make healthy food desirable to children. Normalising a healthy food environment creates a supportive environment for a child to develop healthy food habits early in life.

It was foreseen that the results and recommendations from this research will be disseminated widely; through journals, conferences and multiple stakeholders, including the dietetic and public health professions. The value of sharing this research will be two-fold; new insights into the decision-making criteria that children use to make their food choices in the school setting and a novel study design to gather information that fits with ethical considerations when researching with children. This current research is relevant in the current nutrition climate where there is bold global action to “empower people and create an enabling environment for making informed choices about food products for healthy dietary practices” (9). Finally, a model to guide public health intervention and policy has the potential to support a new paradigm for working with children to improve their eating behaviours.

1.3 Common eating behaviour models

Studying eating behaviours and health promotion is not a new phenomenon. Some seminal work in the area of nutrition dates back many years, such as Darwin in 1878 (39), Montessori in 1912 (40), Baldwin in 1923 (41) and Davis in 1939 (42). The interest in nutrition is likely due to the essential nature of nutrients for survival; however, this claim comes from a professional explanation, rather than from a peer-reviewed source. As such, many models and theories have emerged from research that endeavour to explain the process of food choice in an effort to improve healthy eating behaviours.

For many years, individual behaviour models (such as the Theory of Planned Behaviour) guided research that looked at potential influences on children's intention to make a healthy food choice, even though the theory applies to adults (43, 44). Many researchers have utilised psychological theories that focus on individual behaviours to broaden the understanding of the determinants behind food choices and to implement interventions to improve food-related behaviours (44-46). Individual approaches do not appropriately align with a population health approach when implemented in isolation to creating a community that is supportive of healthy behaviours (43-45, 47). Individualism is a concept supported by neo-liberalism, which holds individuals solely responsible for their own health (43, 45). A public health approach acknowledges that a population's socio-environmental situation (social, physical and political environments) influence people's health (5, 43, 45, 47).

Despite the limitations of the Theory of Planned Behaviour, it provides a plethora of information that is useful for those attempting to understand individual behaviours and/or those who intend to change behaviours (48). The Theory of Planned Behaviour has been used in the context of health behaviours since its inception (49). However, this research is based on a public health, population level, perspective and not an individual perspective. Additionally, the validity of the Theory of Planned Behaviour comes from research among the adult population, not children. While there are some parallels, the Theory of Planned Behaviour was not used as a theoretical underpinning for the research due to the absence of environmental influences on population level behaviour and lack of validity among children.

A public health approach contextualises the statement produced by WHO that emphasises the impact of the environment on health, stating that an effective health behaviour change will not be evident if the environment is not supportive (5). Many WHO documents that guide health promotion action continue to foster an empowering approach for people to increase control over their heath by creating a supportive environment (10, 12, 17, 50, 51). Such frameworks and guiding principles recommend health promotion programs are embedded in settings where people work, play, learn and live (52).

In an effort to provide a framework to address people's interactions with their environment, the Socio-Ecological Model (SEM) was developed by Urie Bronfenbrenner in 1979 (53). This has continued to evolve over the years but the central theme has not changed and that is, the interaction of various environmental factors influences a person's behaviour (44, 53, 54). SEM is discussed further in section 1.3.2.

The WHO remains the peak global body for developing and driving recommendations for action that aim to improve health for all. The Ottawa Charter is also an established framework that was developed during the first global conference on health promotion in 1986 (52, 55). The framework addresses people's interactions with their environment and is recognised worldwide (5). The five action areas recognise that behaviour relates to personal skill development in conjunction with supportive environments, healthy public policy, community empowerment to take action and a reorientation of health services to extend beyond the health sector. Thirty years on and the Ottawa Charter remains central to the transformation of health promotion (52).

The enduring relevance of the charter is evident from the reflection of the action areas in the last two global conferences on health promotion, in Helsinki (Health in all policies, 1993) and Shanghai (Transforming the world: all for health and health for all, 2016) (50-52). While the Ottawa Charter is not a health model, the action areas serve as a framework of guiding principles for planning this research and are discussed further in Section 1.3.3. The next section describes the SEM and then the Ottawa Charter to articulate why the Ottawa Charter was used in the context of a school setting to plan this project.

1.3.1 Socio-ecological model (SEM)

Social, physical and political environments are known as socio-economic factors and it has been established that they affect the health of the population (44, 45, 47, 54). Bronfenbrenner (53) developed a framework that concentrates on the interactions of people with their environment for use in health promotion. While there have been further iterations of the model, it is commonly known as the ecological model of human development or socio-ecological model (SEM) (44, 53, 54).

Key elements of the model include an acknowledgement that multiple systems influence behaviour beyond the immediate environment of an individual (53). In addition, the complexity of environments and humans are emphasised, reiterating that there are many varying interactions and factors, which are forever changing. Hence, the human-environment relationship is not guaranteed to stay the same (53).

According to Bronfenbrenner (53), Moore (44), Townsend and Foster (54), who developed the SEM, the dynamic nature of people and their world calls for a framework that describes the overlapping interactions and influences. Figure 1.1 shows that the individual has overlapping influences from the social environment (family/community/school), the physical environment and the political environment (public policy) (53). Studies that adopt this theoretical underpinning in schools have shown that, by addressing elements in each of the layers in a synergistic and coordinated way, effective behavioural changes can occur (44, 54, 56).

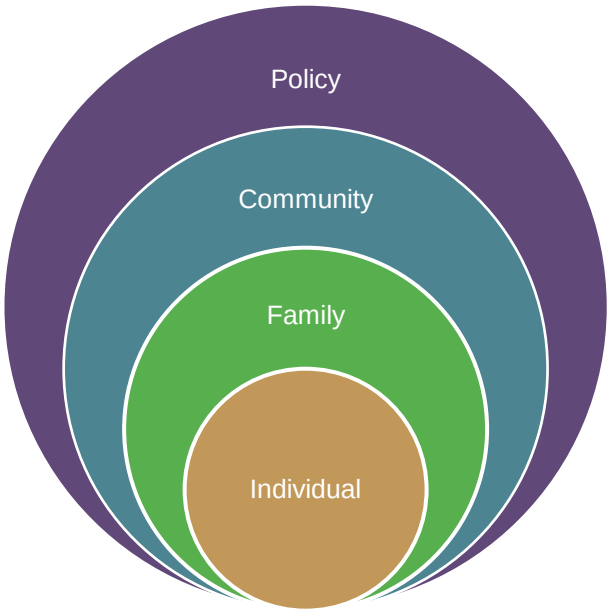


Figure 1.1 The Socio Ecological Model (SEM).

While an SEM approach is suited to an intervention to change behaviours across a community or population, this research precedes a large-scale intervention. Prior to developing a large-scale intervention, an important step in the planning process is to establish needs and knowledge gaps using a smaller-scale study (57). The focus on the research is to discover what process children use to make a decision about food choice in their usual school setting with a view that this information could inform a larger scale population-based intervention. Hence, the intention of the research is not to address the multiple layers of influence but focus on individuals in context with their environment, rather than manipulation of their environment. Many synergies do exist with this model but the purpose of the inductive and participatory nature of this research is to develop new theories, rather than intervene based on an existing theory.

1.3.2 Ottawa Charter

Although developed in 1986, the Ottawa Charter for health promotion continues to be a recognised and valued framework for working in the area of public health (5, 47, 58). Public health has been defined as *"a social and political concept aimed at improving health, prolonging life and improving quality of life among whole populations through health promotion, disease prevention and other forms of health intervention"* (45). The focus of this study is on a particular area of public health, public health nutrition (PHN).

PHN has been described as "the promotion and maintenance of nutrition-related health and well-being of populations through the organised efforts and informed choices of society" (45). Within public health, health promotion is a concept that describes activities to promote health and prevent disease in populations (47, 58). Important components of health promotion include equity and empowerment. To address health in populations the Ottawa Charter proposed five action areas with equal weighting of importance (5) (Table 1.1 The Ottawa Charter's five action areas for health promotion).

The Ottawa charter is broad enough to guide the planning of research without setting out to prove a theory or test an intervention based on a theory. The philosophical approach is described in the methodology chapter (Chapter 3, page 78). The proposed research will use an inductive approach in action research to determine new concepts and theories, which does not warrant a theoretical underpinning. The Ottawa charter provided guidance in the planning of the research as it aligns with a public health approach.

Table 1.1 The Ottawa Charter's five action areas for health promotion

	Action Area	Description
1	Build healthy public policy	Health is a resource for development on a personal, social and economic level; this action area recognises the reality that health is everybody's business, including sectors outside of health (5, 47, 59). Strong and collaborative policies at a national level can support community health promotion (47, 55, 60). A public policy can include legislation, regulation, improving a built environment and community mobilisation (59). An adjunct to the development of a healthy public policy is the ongoing population monitoring and evaluation, to ensure the most appropriate policy is implemented and to ensure a public policy will do no harm (60). However, the evidence surrounding the effectiveness of policies are limited, as clinical evaluation methods are not appropriate for evaluating public health (59). Examples of public policy include mandatory folic acid fortification (60), transport and built environment policies to encourage physical activity (59), taxing cigarettes, compulsory hats during summer at school, compulsory seat belts in cars, a proposed tax on sugary drinks. Healthy public policies support health behaviours in the population (45, 47, 55, 60).
2	Create supportive environments	Supportive social, economic, physical and political environments can all enable healthy choices to occur by removing barriers to better health decisions. A popular catch phrase to capture the essence of this action area is 'making healthy choices easy choices' (45, 60). There is ample support for the claim that personal environment is a determinant of health (45, 47). As described in the SEM section, this support can be created on many different levels (53, 54). While it is ideal to address environments as a continuum across the levels, there is value creating synergistic support in some of the levels (44). A healthy food environment in the school setting is an example of supporting children to embrace healthy food behaviours (61). A healthy school environment is promoting health as a whole of school approach with a curriculum that has opportunities to learn about healthy eating, healthy messages taught and demonstrated in class, healthy options available in the canteen and a school community that reinforces all of the above.

3	Strengthen community action	This action area focuses on increasing community ability to develop solutions to improve local environments to support health and address local needs. Central to strengthening community action are two important pillars of health promotion; empowerment and equity (55, 58). Part of empowering communities is teaching how to take ownership and control over local needs (55), which is also the essence of PAR (62). Equity in health relates to an equal opportunity for everyone to have access to supportive environments, information, services and healthy options to positively influence healthy behaviours (55). A crucial starting point to building this strength is engaging the people to establish what the needs and barriers are to good health. That is, collecting data about a community can then inform public health planning and policy based on actual rather than assumed or extrapolated information. In the school setting, this comment translates to asking the children about their food choice rather than asking adults.
4	Develop personal skills	There is consensus in the literature that improving knowledge and skills is integral in the improvement of health behaviours in the context of local environments. The facilitation of knowledge transfer is recommended through a settings-based approach. The education system is an important setting to support this learning process.
5	Reorient health services	Finally, the last action area in addressing population health according to the Ottawa Charter, is about creating health systems that prioritise the promotion of overall health rather than a reactive approach to individual medical issues. This is not to say that a curative tertiary approach is not important, however it does dominate the health service agenda and reduces the amount of time committed to health promotion efforts in health care services. This action area also refers to health systems that are appropriate in a multi-cultural society. The is no one-size-fits all approach that will work for a whole population, hence, investment needs to be directed to gathering information from sub-populations to enable a targeted and appropriate service provision (60). In short, it is necessary to talk about how to improve risk factors that link to health promotion and disease prevention, in a culturally appropriate way (60).

1.4 The thesis synopsis

The research presented here uses PAR to explore children's own criteria for making food choices. The chapters are structured accordingly after this introduction chapter- Literature Review, Methodology, Methods of Data Collection and Analysis, Findings, Discussion and the final chapter (Chapter 7 - Recommendations, conclusions and author's post-script).

Chapter 2 Literature review

The literature review explores key themes presented in the thesis introduction; childhood nutrition, establishing healthy eating habits early, taste preferences, repeated food exposure, food choice, the role of healthy food environments in the school setting, the canteen and the concept of children as being key informants.

Chapter 3 Methodology

In this chapter, the theoretical underpinnings, philosophical approaches, participatory action research and ethical considerations forming the foundation for this research are described. The Ottawa charter framework with a qualitative, inductive and participatory inference guided the planning of the research by using a Participatory Action Research approach.

Chapter 4 Methods of data collection and analysis

Participatory Action Research (PAR) uses action cycles to understand an issue in a community and to create evidence to initiate change. PAR was used to explore why children make the food choices they do, and see if children can provide a rationale about their motivations behind food choice. Five action cycles were completed:

1. An open class discussion
2. A day in the canteen
3. Discovery Day one
4. Testing a healthy lunch option that meets some of the decision-making criteria children use to make food choices
5. Discovery Day two.

Chapter 5 Findings

The Findings chapter reports data collected from each discrete action cycle in a descriptive chronological explanation. The range of information collected from the five action cycles is then presented analytically, as an interconnected matrix of action cycles. In this light, the data is synthesised and six theoretical concepts emerge. Further conceptualisation of the data led to the development of a theoretical model.

Chapter 6 Discussion

The discussion provides a synthesis of the debate explored in the literature review (Chapter 2) with the findings (Chapter 5). This comparison explores the current public health situation for health promotion in schools, the ideal situation, how PAR was used to progress towards the ideal, how knowledge has progressed since the research and the development of a theoretical model to translate research into practice.

Chapter 7 Recommendations, conclusion and post-script

This chapter deals with the immediate implications that emerged from the research. I will take the opportunity to convey contributions made to both the knowledge of this work's area and to professional practice. The relevance of the research is presented in light of supporting global action on nutrition, the mandatory healthy focus in the new national curriculum across Australia and the clear need to support children to create healthy eating habits early in life. The research has created a new model and contributed to existing knowledge, with specific recommendations to expand this research further. Including the views of children could be what is required to change the eating habits of children in the short and long term. Children are key informants about their decision-making criteria for choosing food and we should embrace the opportunity to work with children in the school setting to improve our understanding around motivators that will support children to make healthier food choices.

CHAPTER 2 LITERATURE REVIEW

Food intake and eating are complex phenomena of utmost importance to the health of both current and future generations (17, 43). Good quality eating habits and optimum health are vital for all children. A highly nutritious diet enables children to maximise their potential to grow and develop, feel at their best and assists in preventing NCDs (16, 17, 20, 21). Healthy eating habits established early in life are more likely to persist into adulthood (23, 31, 63). Giving children a choice of predominantly healthy foods within a supportive environment is a crucial aspect of creating healthy eating habits (32, 64-66). The school is an opportunistic setting to explore how to maximise the support for children to establish healthy eating habits because children spend so much of their early years at school (25, 67, 68). Support can come from a healthy food environment, which includes (but is not restricted to) the school canteen (26, 28, 69). A whole-of-school approach to health promotion can create a healthy food environment across the school that provides credible and consistent healthy messages (26, 70, 71). Evidence has shown this is an effective way to support healthy eating behaviours among schoolchildren (26, 28, 48, 72). The role of children in informing strategies to make better food choices is less defined within the literature. Obtaining the views of the children themselves is an under-utilised and an innovative area of research, especially in Australia.

This narrative literature review aims to provide a background to explain key aspects of healthy eating and childhood nutrition before presenting an appraisal of current research. The review will discuss various aspects of childhood nutrition, including the consequences of not eating a healthy diet in childhood and the relevance of creating healthy habits early in life. The review will then compare and contrast aspects of creating healthy eating habits, including food choice and promoting healthy eating behaviours in the school setting. The literature review will provide a baseline of information to demonstrate where findings from this research may align, build or even contradict with the findings of other researchers in this field. In conclusion, the review will justify the need to increase our understanding about why children make their food choices directly from the children themselves, in order to improve public health initiatives.

2.1 Search strategy

In consultation with a University of Tasmania (UTAS) research librarian, a series of literature searches were conducted using a systematic and comprehensive search completed in August 2015 and updated in August 2017. Alerts were set up to receive relevant papers between August and December, 2017.This approach also aligns with the known approach for a narrative literature review (73).

PubMed, ProQuest, Cumulative Index to Nursing and Allied Health Literature (CINAHL) and Scopus, databases were used to search the literature through the UTAS library database search function. Three groups of terms were established using Medical Subject Headings (MeSH) and keywords. Figure 2.1 depicts the three groups of key words; group 1 aimed to identify studies relating to primary school aged children; group 2 was to find studies relating to the school canteen; and group 3 was to find studies that were about eating behaviours. In each database, three individual searches were conducted based on the silos of terms and then combined using Boolean operators. Once the combined search was complete for each database, the references were saved in a single folder in Endnote (n=5926).

Search results were reviewed four times to remove duplicates and to review titles, abstracts and full articles. The first review eliminated any duplicate references picked up across the different databases. The second review consisted of reading all of the journal titles and excluding those studies that were not relevant, as categorised by the exclusion criteria. The exclusion criteria included: if not primary school age, if not a school setting, if disease or nutrient specific (Nutrient specific studies refers to research that focuses on a single nutrient (example calcium) and nutrient-related condition (example Phenylketonuria)). if not written in English, if focused on breakfast programs (Figure 2.1). The third review used the same exclusion criteria and applied it to each journal abstract. The fourth review used the same exclusion criteria and applied it to each full text article.

Full text articles for the final 480 research papers were accessed and saved in Endnote. The final groups of references were read in full and considered using the same exclusion criteria as review two and three. All papers were incorporated in the literature by grouping the research into similar intervention types and synthesising each paper by method and outcomes to form a narrative literature review. Additional references have been located since the search, from within papers found in the search and through database alerts, and used in the review (74). The total number of references used in the literature review is shown in Figure 2.1.

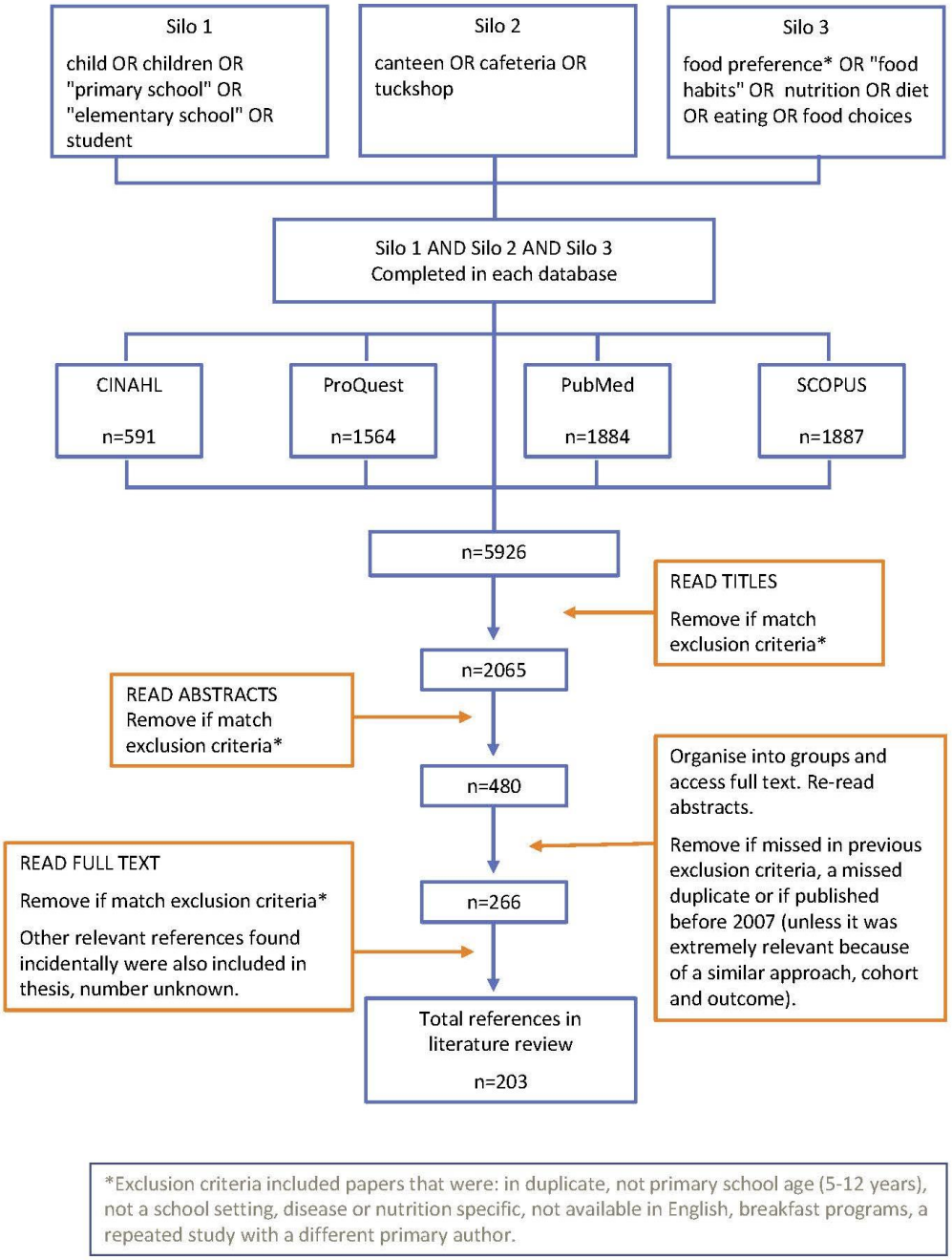


Figure 2.1 The full systematic approach to the literature search

2.2 Background

NCDs, including obesity, cardiovascular disease and diabetes, are appearing in younger ages (4, 5, 13, 75). Many countries have their own evidence-based eating guidelines, which aim to improve health and prevent NCDs (9). In Australia, the Australian Dietary Guidelines (ADG) have been developed to support healthy eating across the population (16). According to the ADG evidence document and the most recent health report (Australia's Health 2016), a high percentage of the population, including children, do not eat a healthy diet in accordance with the ADG (14, 16). For example, only 1 per cent of Australians eat according to the ADG (76) and only 5.1 per cent eat the recommended intake of fruit and vegetables (14). Details about the diet status of Australians are described in section 2.3. Past estimates for the disease burden attributed to chronic disease was 80 – 90 per cent in Australia (7, 13).

It is widely accepted that improving eating habits of children will assist in reducing the early onset of NCDs, in addition to the myriad of other benefits good nutrition will bring to children's health. This review provides an opportunity to explore key concepts relating to healthy eating and children to highlight potential gaps in knowledge. Ideally, research that can fill these gaps in knowledge will enable the development of strategies to halt the rising prevalence of NCDs.

Figure 2.2 was developed by the researcher to capture the elements of the literature review and portray the complexity of factors that influence healthy eating. The 'overall statement' shown in Figure 2.2 captures the key concepts of the research; high quality nutrition in childhood is essential yet children are not following the ADG, the big picture is about establishing healthy eating habits early. The concepts in blue acknowledge factors that affect healthy eating habits that are outside of the scope of this thesis. The concepts presented in green also affect healthy eating and are discussed in the literature review. Finally, the gap in knowledge is an understanding of children's views about food choice, which is presented in orange and forms the basis of the research questions.

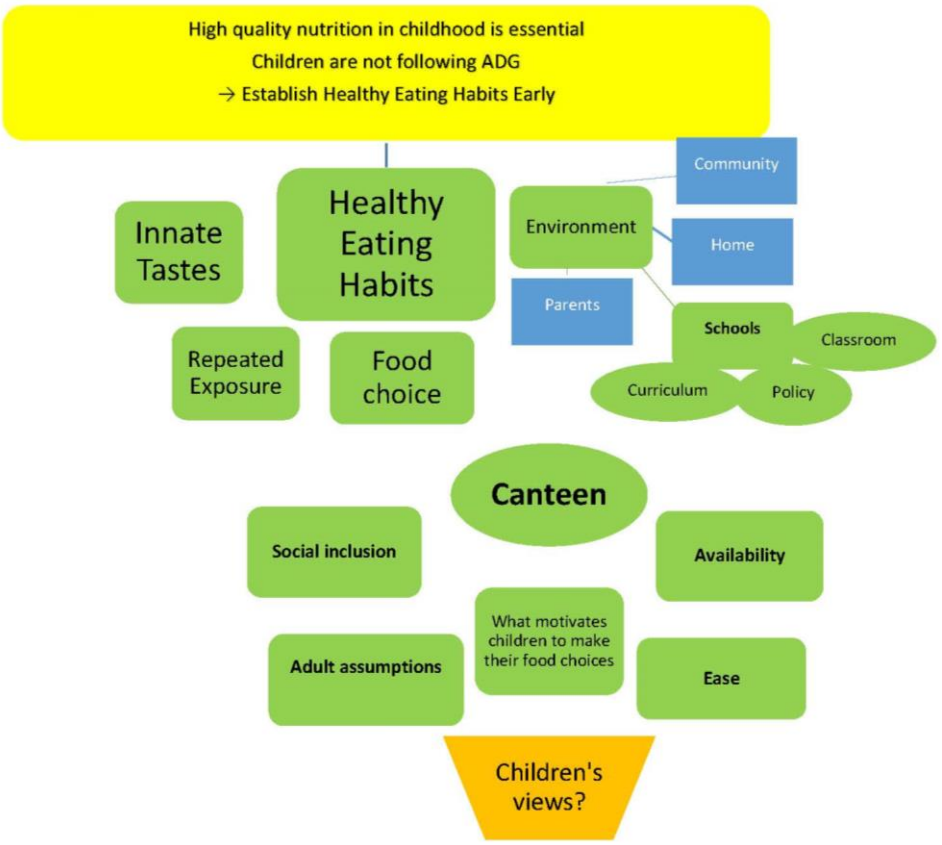


Figure 2.2 A mind map that summarises the context of research (yellow), elements discussed in the literature review (green), relevant concepts that are out of scope for this research (blue),and gaps in knowledge (orange).

2.3 Childhood nutrition is a public health issue

As stated in the Global Strategy for Infant Feeding and Young Child Feeding (24), nutrition is a "*crucial, universally recognised component of a child's right of the highest attainable standard of health*" (24). Globally, there is consensus on the importance of healthy eating for children and the defensive impact healthy eating can have on diet-related diseases later in life. (5, 10, 16, 52, 77, 78).

Inversely, poor eating habits can limit a child's growth potential and these effects can persist into adulthood (17, 63, 79). Other effects of a poor diet include an increased risk of NCDs onset and movement away from healthy weight (7, 13). Research into approaches that support children to improve their nutrition status will have a positive effect on our young and future generations.

2.3.1 Optimal growth and cognitive development

In utero, and in the first three to four years of life, a human can maximise their genetic potential for physical and mental development with a high-quality nutrition intake (5, 8, 16). Breastfeeding exclusively until around 6 months old is the optimal nutrition for infant growth and development (16, 80, 81). At around 6 months of age, the introduction to food becomes paramount (16, 81, 82). A child can still develop with a diet that is depleted in quality nutrients and subclinical deficiencies are difficult to find (82). Therefore, physical growth can still occur with sub-optimal nutrition (82). However, the brain establishes life-long neural pathways early in life. If these pathways are consistently deprived of essential nutrients, they do not develop properly and as a result, mental development potential is compromised (83-85). The result of subclinical deficiencies in children is that they will not develop to their full potential, which is often unreported.

A nutrient-rich diet from infancy to adulthood will maximise growth of muscle, bones, brain and skin (83). A considerable amount of knowledge about nutrient requirements for children comes from studies completed in low and middle income (LMI) countries (83). Children living in such countries, present with nutrient deficiencies severe enough to show clinically. Hence, health professionals were able to estimate which nutrients corrected clinical symptoms. The increase in understanding about nutrient deficiencies resulted in a range of research and the development of Recommend Daily Intakes (RDIs) for many nutrients to protect humans against illness led by nutrient deficiencies (82).

It has been suggested that LMI countries see more clinical deficiencies including low levels of energy, which can result in; Failure-To-Thrive (FTT), Rickets, stunted growth and starvation (11, 83). Historically, high income (HI) countries see more nutrient-poor, yet high-energy diets, which result in sub-optimal growth, excessive weight gain, chronic disease and other health issues (4, 7, 13). Individuals can survive eating an inadequate diet without realising they are malnourished. Sub-clinical deficiencies can affect the veracity of the immune system, physical growth, neuro-motor development and protection against chronic disease (7, 16, 83). While communicable disease used to be most prominent in LMI countries, sub-clinical and NCDs are now growing issues throughout the world (4, 10, 11).

Regardless whether it is a clinical or sub-clinical deficiency, a diet lacking in high quality nutrition can influence growth. For example, most adult bone mass is laid down by the age of 17, the optimal integrity and mineralisation of bone occurs with adequate levels of Calcium, Phosphorus and Vitamins A-C-D-K (16, 83). Foods that predominantly contain these constituents are dairy foods and appear on healthy food guidelines across the globe (33). A severe deficiency of such vitamins and minerals can result in Failure To Thrive (FTT), stunted growth and/or rickets as seen in many developing countries (83). A sub-clinical deficiency could reduce growth without causing obvious problems for people (83). For example, inadequate levels of dairy foods can result in a sub-clinical deficiency in Calcium that, in turn, can reduce the potential of peak bone mass, resulting in a higher risk of osteoarthritis later in life or an increased susceptibility to bone fractures (74). Knowledge gained about nutrient requirements has enabled countries to develop guides to describe a diet that can provide adequate nutrients for optimal growth.

The effect of sub-optimal nutrition is not immediately obvious; therefore ‘selling’ the importance of nutrition is difficult. For example, if a person eats unrefrigerated chicken and gets food poisoning, the message about food safety becomes easier to ‘sell’ as the public can see an instant cause and effect. If a child has poor eating habits, the harmful effects are not likely to emerge until later in life with the onset of a diet-related disease, making it difficult to show a link between poor eating habits and optimal health.

Another research dilemma is that health researchers are not able to compare an individual following two different diets over the same time-period and then compare health outcomes. Some eating behaviour studies have used twins to achieve such a comparison; however, to evoke a dietary intake known to cause harm is an unethical exercise (85, 86). Longitudinal studies, which track a cohort of people through time, help to inform food science about the cause and effect of nutrient intake (23, 63, 87).

Maximising cognitive development through a high quality diet can result in higher levels of education, a known determinant of health (5, 88). The reverse is also true, improving social determinants of health, one of which is education, are known to improve health (43). The amount of evidence available makes it universally clear that nutrition is essential for optimal growth and cognitive development, which is reflected in various food guidelines across the globe (10, 16, 17, 20, 24).

2.3.2 Healthy eating habits persist into adulthood

As emphasised already, healthy eating habits are important throughout the lifespan, and habits formed early in life persist into adulthood (22, 23, 89, 90). The onset of ill-health typically seen in children, 1-14 years old, attributed to chronic disease (asthma, type 1 diabetes and cancer), has not been associated with diet (91). However, children with poor eating habits will be at higher risk of other diet-related disease onset earlier in life compared with children who eat a healthy diet (5, 7, 16, 75).

Not discounting the public health issue of excess weight, all children should be encouraged to form healthy eating habits early, regardless of weight (24). Currently, the variance in overweight/obesity trends between adults and children, as reported by the Australian Bureau of Statistics in 2016, was 63.4 per cent of adults and 27.4 per cent of children indicating that many children of healthy weight will become overweight adults (92). Venn and associates also extrapolated that while BMI in children predicts BMI in adulthood, a large number of overweight adults were healthy weight children (63). Hence, not only overweight children will become overweight adults. In addition, growth, well-being and oral health issues can occur among children of any size (7, 91, 93). Therefore, efforts to improve healthy eating should be targeting all children, regardless of weight.

Given at least 80-90 per cent of the disease burden in Australia is attributed to chronic conditions, the focus on establishing healthy eating habits for *all* children will have positive impacts across a large proportion of the population (14). There is global support for the promotion of healthy eating directed at children of any age and size (5, 14, 24). Therefore, health promotion initiatives and policies that aim to improve childhood nutrition will have a positive impact on eating habits, which will positively influence health across the lifespan.

2.3.3 Health and disease prevention

Healthy eating habits positively protect people from disease (7, 13, 15, 16). The World Health Organisation (WHO) defines health as *"a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity"* (94). This definition highlights that health is more than an absence of disease and has aspects outside the control of individuals. In Australia, two key government documents provide a definition of health. The Aboriginal Health Strategy Working Party released their version of a health definition in 1989; *"not just the physical well-being of the individual but the social, emotional and cultural well-being of the whole community"* which supports the WHO notion of health being beyond just that of the individual (7). More recently, Australia's Health 2016 adopted a broad view of health and emphasised that "*health is an important part of well-being, of how people feel and function…health contributes to social and economic well-being" (7, 14).* This articulates there are many aspects of health, supporting the notion that people might not have an illness but they can still be unhealthy and at risk of developing a disease. Hence, it is important to promote good health to whole populations in an effort to prevent disease onset, which is often gradual over time (7).

Being healthy stems from people eating a nutritious diet and engaging in other healthy lifestyle factors including physical activity, not smoking and not drinking alcohol to extreme (4, 7, 8), all of which are known to protect people against NCDs (4, 7, 16). While it is recognised that protective factors for NCDs extend beyond diet to other determinants of health such as lifestyle factors, the environment, social determinants of health and age (4, 7), this paper focuses on the protective effects of healthy eating among children.

2.3.4 What does good nutrition mean - Australian Dietary Guidelines (ADG)

Most countries around the world have developed healthy eating guidelines to help support their communities to maximise their nutrition, that will in turn maximise their protection against avoidable disease (95). The Australian Government (95) developed the first ADG in 1982. In 1991, Recommended Dietary Intakes (RDIs) were developed for each nutrient and formed the basis of the second ADG, released in 1992 (82, 95). In 1994, Core Food Group were created to translate the detail of the ADGs into food types (82) and a third iteration of the ADGS were released in 2003 (95).

In 2005, following on from the UK, US and Canadian Governments - who calculate a set of nutrient values to identify an average requirements for individuals - Australia and New Zealand completed the Nutrient Reference Values (NRV), for Australia and New Zealand populations, which were released in 2006 (82). NRV were designed for generally healthy people and emphasise that NRV is not sufficient for individuals with specific nutrition requirements (82). Forty nutrients were included in the NRV document and are expressed as (RDIs) and Estimated Average Requirements (EAR), Adequate Intakes (AI) and Upper Limit of Intake (UL) (82).

The level of health literacy required to interpret nutrient specific information and translate into food equivalents is high. Six out of ten Australians have low health literacy levels (96). In 2005 The Australian government released the Australian Guide to Healthy Eating (AGTHE) (97) to translate the complex layers of information into a format more suitable for communication to the public. The ADG and the AGTHE were revised in 2013 utilising over 55000 peer-reviewed articles to review and supersede the previous versions (16).

The aim of the ADG is to recommend various foods, which provide a range of regular nutrients for good health and also to help reduce the risk of chronic health problems (16). The target is a generally healthy population and it is not designed for individuals with specific dietary needs. There are five overarching guidelines as shown in Table 2.1.

Table 2.1 The Australian Dietary Guidelines include five overarching guidelines

Guideline 1	"To achieve and maintain a healthy weight, be physically active and choose amounts of nutritious food and drinks to meet your energy needs." Guideline 1 encourages a regular intake of good quality food and physical activity across the life span, with energy intake and expenditure being in balance.
Guideline 2	"Enjoy a wide variety of nutritious foods from these five food groups everyday" The five food groups include vegetables, fruit, grains, milk/yoghurt/cheese and their alternatives plus lean meats/poultry/fish/eggs and their alternatives.
Guideline 3	"Limit intake of foods containing saturated fat, added salt, added sugars and alcohol." Such foods are often low in nutrition and high in energy density, and referred to as 'sometimes' or discretionary foods.
Guideline 4	"Encourage, support and promote breastfeeding." This is in recognition of research which supports the protective quality of breast milk for babies (80).
Guideline 5	"Care for your food; prepare and store it safely."

The ADG are supported by the AGTHE which visually represents the guidelines on a plate with examples of food and recommended proportions of each group (97). In addition, the AGTHE promotes plain water to drink and small amounts of good quality oils. The supporting booklet for the AGTHE suggests serve sizes of each food group, which depends on age and physical activity (97). More importantly the guide suggests a daily mix of everyday foods from the five food groups and an infrequent intake of 'sometimes' foods, also referred to as discretionary foods (97). In Australia, much of the population is not eating according to the ADG (14).

2.3.5 Children are not eating according to the Australian Dietary Guidelines

Since 1985, there have been several national surveys used to assess food intake of children and compared with the ADG (19, 92, 98). Each survey showed a mismatch between the food intake of children and the ADG food recommendations. Of particular interest were changes in energy, 'sometimes' food, vegetables and fruit. Between 1985 and 1995 the energy intakes of school children increased by 0.5 – 2.0 Mega Joule (MJ) per day (21). This coincided with an increase in prevalence of childhood obesity, as discussed in the next section (21).

Since this time, national surveys have continued to report that children are not consuming recommended intakes of vegetables and fruit (in line with the ADG) while exceeding recommendations for 'sometimes' foods/drinks and energy (27, 81, 92, 93, 99). The 2011-12 Australian Health Survey reported 93 per cent of Australian children aged 4-13 years did not meet the recommended serves of vegetables per day and 20 per cent did not meet fruit serves per day (19). More recently, it has been reported in the National Health Survey 2014-15 that only 5.1 per cent of children met the recommendations for fruit and vegetable intake (92). More specifically, only 2 per cent of school aged children (5-14 years old) consumed recommended intakes of fruit and vegetables (14). The Australia's Health 2016 report conveys that high intakes of 'sometimes' food/drinks remains, with 39 per cent of energy in a child's diet, on average, coming from foods that are low in nutrients and high in energy (14). This is similar to the amount of 'sometimes' foods reported among children two years previously, which was 41 per cent (7).

In addition to surveys, research studies have emphasised a mismatch between the current ADG and the intake of these foods in young children (18, 89, 93, 100). The evidence has consistently shown the intake of nutrient dense foods, in particular vegetables and fruit, is below the Australian recommendations, while children are eating excessive amounts of 'sometimes' foods that are low in nutrients and high in energy.

2.3.6 Consequences of poor eating habits

Persistent low intakes of food containing essential nutrients and high intakes of foods low in nutritional value lead to poor eating habits and malnutrition. Malnutrition in all forms emerge over time and can result in a range of health effects including NCDs (discussed in section 1.1, Population health perspective), overweight, underweight, or various nutrient deficiencies (9-11, 14, 52). Because symptoms or outcomes of poor health occur over a long period, the cause and effect of unhealthy eating behaviours are not often obvious to individuals.

Overweight

One of the outcomes of poor eating habits is overweight/obesity, commonly known as the result of an imbalance between energy consumed and energy expended (16, 17, 22, 23, 25, 101). In a range of systematic reviews commissioned to produce *Clinical practice guidelines for the management of overweight and obesity for adults, adolescents and children in Australia (2013),* excessive weight gain was reported as more than an energy imbalance (101). Body-weight regulation systems are complex; each time a person experiences weight gain their body readjusts their set-point to maintain the new weight involving a change in appetite and regulation of energy coming in and out (101).

In addition, there are a number of indirect factors affecting the obesity epidemic which include social, environmental, behavioural, genetic and physiological factors (7, 101). National monitoring of population weight and health behaviours is limited. Data has been collected in 1985, 1995, 2007, 2011/12 and 2014/15 (7, 19, 63, 98) and each time the methods were different. Due to changes in the methods used to collect weight data, a direct comparison is not possible over the five time-spans.

The most recent National Health Survey was conducted over 2014 and 2015 (19). Despite the apparent slowing incidence of overweight in Australia, excessive weight among the population is a serious public health issue (7). The issue extends to children, where there appeared to be a large spike in rates of childhood overweight and obesity from 1985 to 1995 (about 11.3 per cent to about 21 per cent) (21). Over the next 20 years, the rates have increased by approximately 6.5 per cent (14).

Prevalence figures of overweight/obesity levels were 22 per cent in 2007, 25 per cent in 2001-12 and 27.4 per cent in 2014-15 (7, 19, 92, 101). As mentioned earlier in this thesis, and worth emphasising, a strong correlation exists worldwide whereby children with poor eating habits and/or excess weight are likely to carry these into adulthood (7, 16, 17, 19). Thus, it is not just overweight children who will become overweight adults (63, 93). Children who currently sit in the healthy weight range and have poor eating habits are at risk of adulthood obesity (63, 93). This again emphasises that health promotion initiatives targeting an increase in fruit and vegetable consumption and a reduction in foods with poor nutritional value among children should be directed to all children, not only those with excess weight issues.

Underweight

The increasing prevalence of underweight children has not received the same attention as overweight, even though both can be consequences of poor eating patterns and carry health risks (7, 14, 43). The rate of obesity and underweight among children was similar in 2011-12, seven percent and five percent respectively (7, 19). In addition, as introduced earlier, under nutrition can also affect physical and mental growth, oral health and increase the risk of chronic disease later in life (7, 16). This exemplifies why healthy eating is important for all children, not only children classified as overweight/obese. The case-in-point being, that a focus on collecting information to contribute to the body of knowledge to improve healthy eating among all children is essential.

Nutrient deficiencies

From a global perspective, deaths attributed to malnutrition, particularly maternal and child deaths, have decreased since early 2000 (10, 11). However, the burden of malnutrition, which leads to nutrient deficiencies, have extended in scope by the coexistence of undernutrition with overweight and NCDs (10). Now, there is a call to address all forms of malnutrition (including underweight, overweight, and NCDs) that will result in less nutrient deficiencies (9-11).

In Australia, Nutrient Reference Values (NRVs) indicate the average daily intake of forty nutrients required to prevent deficiencies (82). Given there is a gradual progression towards NCDs onset that is linked to long-term poor dietary habits, rather than just food consumed in recent times, sub-clinical nutrition deficiencies can go unnoticed for many years (7, 16, 83).

In Australia, the most common nutrition deficiencies stem from a discord between food eaten and food recommended as described in the ADG. The most comprehensive investigation of food eaten was the 2011/12 Australian Health Survey and included a 24-hour diet recall and usual intakes. The AHS in 2011-12, and more recently in 2014-15, showed that Australian adults and children are not eating according to the ADG (19, 92). Therefore, it is likely that many Australians, have a sub-clinical deficiency. As previously mentioned, eating according to the ADG can protect against nutrient deficiencies for most people, except for a small number of the population who have an illness that requires specific nutrient intake (16).

2.4 Establishing healthy eating habits early

Preceding a discourse on eating habits, factors that create a preference for food in the first place are described. The following section will look at the innate dispositions to taste, specific taste investigations, and the influence that repeated exposure of foods can have on intake. After which, the topic of eating habits will be examined. Aspects of the development of food preferences include genetics, parental sway, the food environment, innate taste preferences and exposure to food (84, 90, 102, 103).

2.4.1 Innate taste preference

Although the term 'innate taste preference' is used to generalise a biological phenomenon in childhood, a detailed view of the research reveals distinct differences in taste preference depending on age. To establish clarity in the meaning of terms used in this section, the words innate, taste and preference are defined. The term innate can be defined as *"existing in, belonging to, or determined by factors present in an individual from birth"* (104). Taste is a concept that describes how one perceives the flavour of food and drink in the mouth (104, 105). Pleasure, which comes from taste, is a major driver of food selection (90, 103). Preference describes *"something that is liked or wanted more than another thing"* (104). Whereas, liking is the hedonic response to a single taste, rather than preferring one taste compared to another (104-106). Taste, one of the five senses, is the largest contributor to food preference (105, 107, 108). Humans can detect six tastes: sweet, salty, bitter, sour, umami (a strong savoury taste high in glutamates; like miso, cured meat and mushrooms) and fatty (105, 109).

A range of seminal research studies completed with neonates at birth suggests 'innate' or 'inborn' traits, relating to taste preferences and aversions, exist prior to external influence or learned experiences (84, 102, 110-113). Taste preferences, food preferences and food choice are interrelated from about six months of age, when solid foods are first introduced, through to adulthood. Many studies in children look at response to taste stimuli; however, as individuals move through adolescence to adulthood, taste preference is more so measured by food choice.

Research by age

In utero, babies are exposed to various tastes through the amniotic fluid (90, 105, 114). Tastes begin to form at around seven weeks of gestation and early research does indicate that different tastes can influence fetal swallowing of amniotic fluid (115). For example, the presence of saccharin increased fetal swallowing in utero (115). Figure 2.3 shows a timeline depicting research about taste preference that has taken place; at birth, within the first week of life, in early childhood, primary school, adolescence and adulthood (31, 90, 102, 111, 112).

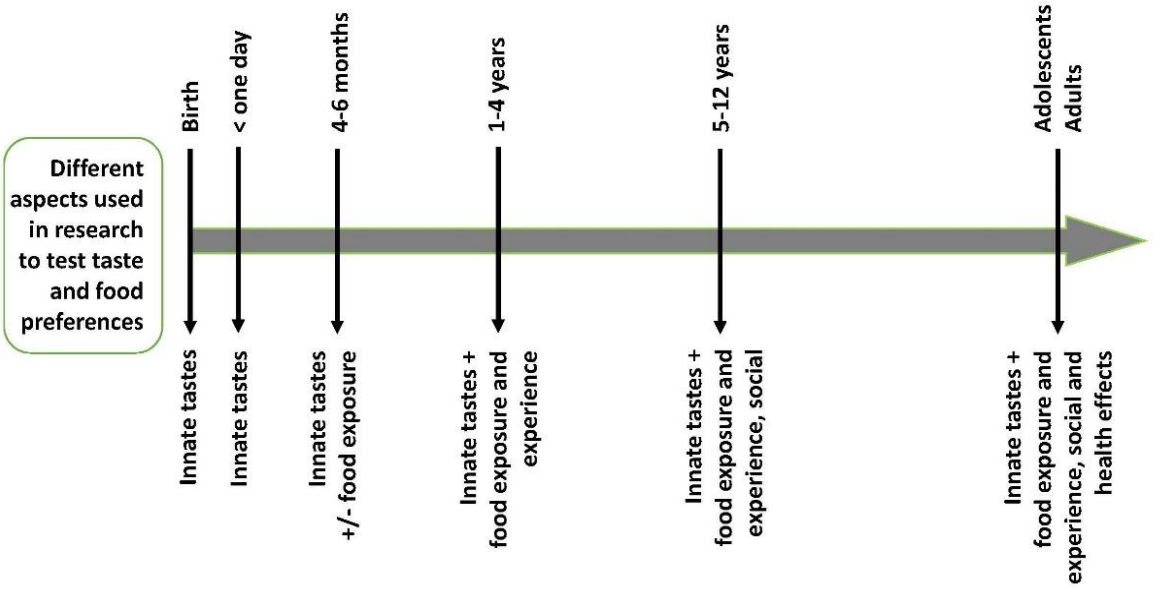


Figure 2.3 Different ages that research has been conducted on humans to establish taste and food preferences

BIRTH

Seminal studies were completed on animals and humans at birth to understand innate sensory responses to taste (110-112, 116, 117). Measures used to determine a liking or taste preference include ingestion of solutions with various concentrations of flavour, facial expressions in response to flavours and the electrical activity response after ingesting different tastes (31, 86, 111, 112, 117). Some studies tested neonate response to various tastes prior to being offered any breastmilk or formula (112, 114, 118).

There is a strong consensus across studies that an innate liking for sweet and fat, an aversion to sour and bitter, and an indifferent response to salt, exist at birth. In 1970, Nesbitt and Gurwitz (117) showed that among 42 term babies (aged one to four days old) of various weights, all neonates consumed more formula with added sucrose compared with usual formula. The study concluded an innate preference for sweet tastes exists at birth (117).

Desor et al. (110, 111) measured the quantity of ingested solutions - containing various concentrations of salt, sour, sweet and bitter tastes - to determine taste preferences in babies aged one to four days. Over two studies the research group revealed a liking for sucrose (sweet), and a preference of sucrose compared with water (110, 111). When a sucrose solution was mixed with citric acid (sour), ingestion was decreased (111). The amount of fluid ingested when sucrose was mixed with sodium chloride (salt) or urea (bitter) was indifferent to the intake of sucrose only (111). Given there was a clear preference for a sweet tasting solution, the study did not ascertain whether the effect of mixing salty or bitter flavours with a sweet flavour improved the acceptance of those flavours (111).

In 1977, Steiner (112) used facial expressions to measure the gustatory response of neonates to different tastes: testing took place prior to, and three to seven days after any first food (breastmilk or infant formula) was offered. Distinct expressions were observed for sweet (relaxing facial muscles, licking and sucking movements), sour (pursing lips, blinking eyes, and wrinkling eyes) and bitter (depressing mouth angles, protruding and flat tongue, rising upper lip) (112). The study concluded that humans are born with an innate preference for sweet tastes and aversion to sour and bitter tastes (112).

Six years later, Ganchrow et al.(119) measured the gustatory response of fourteen term-born neonates to sweet, bitter and sour tastes. Like the Steiner study, infants showed a favourable response to the sweet taste and unfavourable responses to sour and bitter tastes (119). Although the aversion to sour and bitter tastes is in contrast to those reported in Desor's research, Steiner (112) and Ganchrow et al. (119) tested individual flavours (rather than mixing with sucrose) with infants providing a direct response to that taste .

Rosenstein and Oster (114) repeated a similar study to Steiner's, including a more thorough coding system and testing procedure. Consensus between all the studies was that infants are able to differentiate between the tastes, with a definite preference towards sweet tastes (110, 112, 114, 117). Rosenstein and Oster's research (114) also showed that infants displayed a general negative response to the non-sweet tastes (sour, bitter and salt), however the researchers felt the response to salt was not strong enough to be conclusive. Other research shows that liking for salty taste at birth is concentration dependent; newborns are indifferent to moderate concentrations (120), but respond aversively to higher concentrations (121). It appears there is more evidence to support an aversion to sour and bitter tastes, and an inconclusive response to salt (111, 112, 114).

Blass and Fitzgerald (116) extended knowledge about preference to sweet foods by testing a liking to a sweet taste combined with fat in rat pups using milk. There was a higher preference for milk (made up of fat and sweet flavours) compared with only sucrose (sweet) (116). Mother's milk is the sole food for all neonate mammals and required for survival (86). It makes sense that animals are biologically programmed to like sweet and fat flavours, as breastmilk (and infant formula) is predominantly made up of sugar and fat (86). Sugar and milk have been shown to result in an opioid response that provides pain relief and has a calming effect on newborns (86, 90, 103, 116). Therefore, at birth there is consensus that babies have an innate taste preference for sweet, some evidence of an innate liking for fat, an aversion to bitter and sour, and a lack of consensus about the liking of salt.

EARLY CHILDHOOD

Increasing knowledge and understanding about children's taste and food preferences is not a new phenomenon. As far back as 1877, Charles Darwin (39) observed a preference for sweet and sour tastes in his young children, as translated in Liem and Mennella (122). Children across the globe tend to prefer foods that contain sugar (sweet) and fat, and generally dislike vegetables (bitter) (31). Among young children from the age of one, research starts to show the impact of repeated exposure and the food environment on food preferences. It is clear from the research that innate preferences and aversions can change (86, 118).

In 2015, Mennella and Bobowski (86) reviewed a range of studies about children's taste preferences and described strong evidence to show the innate preference for sweet and dislike for bitter tastes were still present in early childhood. Similarly, Beauchamp et al. (118) observed infant's acceptance to sweet and an indifference, or rejection, of a salt taste at birth. Infants from the cohort were fed additional sweetened water or plain water and tested again at six months, then two years (118). At two years of age, a higher intake of sweetened water was observed among children that had been fed additional sweetened water from birth compared with those fed only plain water (118). The results showed that while children are born with a liking for sweet tastes, extra exposure to sweet will maintain that liking compared to no extra exposure (118). Intake of salted soup and carrots were observed with the same group of two-year-olds (118). It was observed that children who ate more of the salted soup (compared with unsalted soup), ate more salted carrots (compared with unsalted carrots) (118). While a preference for salt is indifferent, or rejected, at birth, a sensitivity starts to slowly develop in the next year or two in some children; however, the mechanism for this is unknown (114, 118).

Lioret et al. (87) endeavoured to follow dietary patterns among a cohort of children at age two, three and five in recognition that early food exposure can influence the development of food preferences, which will affect eating habits later in life. Single tastes were not tested as children are eating a range of whole foods at this age (87). Two main results were found, which support other research; children with younger and less educated mothers have a less healthy diet compared with children of more affluent and older mothers; moderate tracking of dietary patterns was seen from two to five years old (87). Concluding recommendations from the study were that regular healthy feeding practices should commence as young as infancy, given that taste and food preferences are shaped by exposure and experience from early childhood (87).

PRIMARY SCHOOL AGE

While children's food preferences are largely driven by taste (102), research starts to focus on children's food choice as a proxy to determine preference as they get to school age, rather than taste (87, 123). It appears that primary school-aged children (aged 5-12 years) still like typical innate tastes (sweet and fat dominant foods), which makes sense from a biological perspective as they are still growing rapidly so seeking high energy foods (84, 86, 103). At this age, some children acquire a preference for highly sour foods, a liking for salt tastes has developed and generally, there is still an aversion to bitter tastes (84, 90, 122, 124).

Liem and Mennella (122) noted the successful marketing of extreme sour confectionary for children, indicating that there may be children who like a sour taste. Mothers and children aged five to nine years old were recruited to establish preferences for sour tastes amongst the cohort of children (122). The study design used a rank-by-elimination process in the context of a game to collect data from children and a series of questionnaires with the mothers to establish their child's reaction to new foods and level of neophobia (122).

Neophobia describes a fear of new food in which children need to be exposed to some new foods up to 8-10 times before they accept it (65, 90, 125). For some foods predominant in preferred innate tastes, for example sweet foods, children need less exposures to the food before they accept it, compared to a less preferable taste such as bitter (29). Liem and Mennella (122) showed about one third of the children had a heightened liking to sour foods. Additionally, those children with a preference for sour foods were less neophobic. The study provides support to Darwin's proposition, from many years before, that some children develop a taste preference for sour foods (39, 122).

Bouhlal et al. (124) studied the impact on food intake when salt concentrations in two familiar foods were altered. Green beans and pasta were foods familiar to a cohort of primary school children aged 8-11 years (124). The study established that consumption of green beans decreased when the beans had no salt added, while the intake of pasta increased when salt was added above concentrations normally offered to the children (124). While these results are not able to be generalised to all foods as the response could be product-specific, it does support other evidence that shows a preference for salty food among children develops (84, 124).

Thus far, evidence from birth to early childhood shows that children are vulnerable in the current Australian food system as they have biological preferences for high-energy foods. An innate disposition to sweet and fat tastes, a learnt preference for salty foods and a natural aversion to bitter foods do not align with ADGs. The food system contains an abundance of highly processed and poor nutrient choices that have excess amounts of added salt, sugar and fat. Children's food preferences and the availability of poor nutrient choices are at direct odds with the current healthy eating guidelines (84).

ADOLESCENCE AND ADULTHOOD

Research that focuses on specific tastes in adolescents and adults is less common. A possible reason is that taste preference is not a good indicator of food choice and food intake among adults as they are guided by nutritional beliefs, diet trends and social norms (102). However, adults still relate to taste. For example, in 2011, Krolner et al. (107) reported that among a group of adults the main reason vegetables are disliked was attributable to the sour and bitter taste. Research has shown that about two thirds of the adult population are sensitive to bitter taste (90). Adults do show a liking of sweet foods but their preferred concentration of sweet foods, referred to as their 'bliss point', is lower than primary school children (86). There is evidence of a liking for salty foods during adolescence and adulthood, suggesting this preference increases with exposure over time (84, 124).

Additionally, there have been reports that adults prefer unhealthy foods as they are more palatable (these are typically high in sugar, fat, salt or a combination), and the increase in sugar intake at a population level has been paralleled to the rise in obesity levels by some researchers (103). A heightened focus on understanding adolescent and adult taste preferences is likely to increase given the sheer amount of processed and refined foods being marketing across all ages in our current food system and the continual rise of diet-related NCDs. On a global level, the re-emergence of nutrition as a focus for improving health is reflected in current key global initiatives (10, 11, 52). While an understanding of adolescent and adult taste preferences would provide a broad context that will be relevant for children as they get older, the focus of this research will be to present evidence about children.

Innate taste summary

More consideration of children's chemical sensory reactions is required, as they are different to an adult. At birth, there is a natural affinity to high-energy tastes (sweet and fat), an aversion to potentially dangerous tastes (bitter and sour) and an ambivalent response to salty tastes (the hedonic response to salty food is dependent on the concentation and known to increase once solids are introduced at around 6 months old). This review supports other research that found young children prefer sweet foods (86, 102, 109). More detail about taste specific investigations can be found in Appendix 10. Highly processed foods ('sometimes' foods) - high in fat, sugar and/or salt - are popular with children. Generally, children dislike vegetables, which are bitter (86). Furthermore, a bitter taste mixed with a preferred taste - such as sweet, fat, salty - can make the food more acceptable (86, 106). For example, cocoa is a bitter compound, which many people do not prefer. A world-wide review showed children's favourite food in western societies was chocolate (109). Although chocolate has a bitter cocoa base, the addition of sugar (45 per cent sugar) and fat (30 per cent) transforms chocolate into a highly palatable and popular food (106).

Because adult taste preferences are different from that of children, children's taste preferences need to be better understood to provide healthy options to match what 'hits the mark' for children (109). Health professions and policy-makers should consider this in eating guidelines for children; are the ADG appropriate for children? Children have an affinity to high-energy food because they are growing rapidly. Humans have also evolved to survive in an environment with less access to a consistent supply of food. This is different to the current food environment, which has easy access to highly processed and refined food, termed obesogenic. An obesogenic environment is one with easy access to unhealthy foods and fosters eating habits that are inconsistent with ADG (90). Despite these innate traits, children's food preferences can be altered through repeated exposure to other foods and exposure to a healthy food environment (84, 102, 126).

2.4.2 Creating healthy eating habits through repeated exposure to healthy food

Repeated exposure to food can occur in-utero, during infancy and childhood, right through to adulthood (84, 90, 105, 114). Taste preferences can be influenced by repeated exposure, even before a child is born (90, 105). From the third trimester, children are experiencing varied tastes, depending on what the mother is eating, through amniotic fluid, which can affect the neophobic response to food (90, 103, 105). Infants who are breastfed will continue to be exposed to various tastes though breastmilk (103, 105).

Building on previous discussion, at about six months of age, solids are introduced and neophobia can be observed (84, 90). Neophobia is a known characteristic of omnivores that describes a 'fear of the new', and thought to play a protective role against the ingestion of foraged food that could be poisonous (86, 90, 108, 111). The neophobic response is lowest during the first introduction to solids and then the response increases, sometimes requiring food exposure of 8-10 times before the food is accepted as safe and familiar to eat (84, 90).

Research also supports the link between food eaten by mothers during pregnancy and the reduced neophobic response of the child to that food once eating solids (105). Infants who are breast fed will be less neophobic to the tastes they are exposed to through breast milk (127). Once infants commence solids, repeated exposure of new foods can address the neophobic response by increasing the familiarity, learning of new flavours and acceptance of new foods (65, 84, 103).

Neophobia continues into childhood when the establishment of healthy eating habits is crucial. A change in food preference can occur through repeated exposure to foods, which can improve the acceptability to new foods (65, 105, 125). Although neophobic response reduces as children move into adolescence and adulthood, a focus on repeated exposure of healthy foods early in life increases the acceptability of tastes that children innately dislike, to support the formation of healthy eating habits early.

Repeated exposure links to a range of factors that influence food preference, which can help or hinder the development of a healthy eating habit (105, 107). The concept of food rewards can highlight how repeated exposure can influence food preference in a negative way (29, 65, 90). When parents provide a particular food to reward a behaviour, or link a food to a positive event, children are quick to associate that food as desirable (65, 90, 105). Social environments play a part in influencing food intake (105). For example, the consumption of disliked vegetables increases when children had the opportunity to see others consume that food, in particular when observing parents, older children and adult heroes (90, 128).

Repeated exposure to healthy foods can be achieved through school gardens, which can serve to increase cooking skills, understanding of where food comes from, familiarity and acceptance of food (107, 129). Lakkakula and associates (128) found that children who were given the opportunity to taste four fruits and four vegetables over an eight-week period increased their liking for that food. Children who began the program disliking these foods changed their views and liked them after the program (128).

Similarly, in 2016, Ensaff et al. (129) measured the impact of the Jamie Oliver Kitchen Garden program in the United Kingdom. They also found an improvement in cooking skills, taste descriptions and food awareness but did not establish an intervention effect for food neophobia (129). In unpublished evaluation, Yeatman and colleagues (130) released a final report for the Australian Stephanie Alexandra Kitchen Garden Program. The Stephanie Alexandra Garden Program is an initiative in Australian primary schools to increase children's food awareness (seed to plate) - especially vegetables and fruit - and cooking skills, with the ultimate aim to improve eating behaviours (130, 131). Based on qualitative data, Yeatman et al. (130) also reported an improvement in cooking skills, food awareness and willingness to try new foods after the program. However, they reported an improvement in food choice (130).

In contrast, a published quantitative study on the same program did not find that the program extended its influence to food awareness and healthy eating but did show an increase in cooking skills and willingness to try new foods (131). Because a sustainable change to eating habits is a long-term outcome, to know the true effect of the kitchen garden concept these evaluations could provide more accurate outcomes if they are repeated every 2-3 years. Despite the inconsistencies in some findings, they appear to improve food awareness, cooking skills and willingness to try new vegetable and fruit-based food. Other research indicates that vegetable and fruit intake during childhood is a strong predictor of adequate intake in adulthood, more so than a combination of other factors (such as gender, education, income) (89).

In summary, repeated exposure is essential to move children through the neophobic response to food, to a point where it becomes safe and familiar. There is support from a range of evidence that repeated exposure affects food preference and food choice in the short and long term (90, 105, 107, 108). Thus, repeated exposure of high-nutrient dense food is required to create a healthy eating habit. Most reports about children's decision-making processes about food are based on parents' views about their children's preferences and their own food acceptance (108). While food preference can change, more research based on children's versions of their preferences could assist the development of strategies that use repeated exposure to increase preferences for healthier options (108).

2.5 Food choice is important for the establishment of a healthy eating habit

Providing food choice is an integral part of developing healthy eating habits among children (22, 23, 30, 89). However, research has shown that when unhealthy food is available as well as healthy food, children will generally choose the unhealthy option (29, 132). Current research supports the need to provide a healthy food environment for children, which encourages better food choices. After comparing and contrasting the evidence, banning or restricting all unhealthy food choices does not appear to teach children to develop healthy eating habits long term (29, 31, 64, 133). Yet, free access to mainly unhealthy food does not provide the environment to make a healthy choice (28, 132). Pertinent research will be discussed to explore the concept of having better food choices available within a healthy food environment to encourage healthy eating habits amongst children (28, 133).

2.5.1 What do we mean by children and choice?

Definition of a child?

In this thesis, a ‘child’ is considered to be anyone under the age of 18 years; 18 being the age that most major decisions become legal (134, 135). For some decisions, such as the age one can get a full time job and medical consent, then the age of 16 years is commonly accepted (135). The research presented in this thesis was among children within an age range of 7 to 12 years old and this age range will be the focus of this review. Some of the studies explored in the literature review may include groups of children outside of this age bracket (younger than seven, or older than 12) and the relevance of including such studies is clearly articulated.

Definition of choice?

Choice is a challenging concept, as there are many ways of interpreting what the idea means. The Meriam-Webster dictionary defines choice as "*the act of picking or deciding between two or more possibilities" or "the opportunity or power to make a decision"*(104). Further, a decision can be defined as *"the act or process of deciding" or " a determination arrived at after consideration"*(104). Choice can therefore relate to; a restriction or opportunity in the act of deciding; not having options available to enable the act of deciding; or removing the power to make a decision. In addition, food choice can involve a decision on what, when and how much food is consumed. With this in mind, a range of literature was screened to determine various aspects of food choice in relation to children.

At what age can children make a choice?

From a young age, individuals begin to make choices about self-regulated play, sleep and food (125, 134, 136-138). Young babies are able to communicate when they are hungry and decide how much they feed (125, 139). As babies grow and develop, they decide what toy they will play with (140) and after about six months, how much food they will eat (65). Childcare centres in Australia are encouraged to incorporate choice in programs to teach children about making decisions (140).

By the time a child reaches primary school (4-5 years old), they have the cognitive ability to make some daily decisions (136, 137, 141). In relation to food choice, nutrition professionals around the world have advocated for adults to let children decide if and how much they eat, a concept known as the Division of Responsibility (DOR). The DOR concept centres on parents providing healthy choices regularly and children deciding what and how much to eat (65, 142, 143). At a local level, in Tasmania, sectors who work with children are encouraged to provide people under the age of 12 with opportunities to be involved in matters relating to their own health and wellbeing (144). A body of literature acknowledges that children have the capacity to articulate their views and their participation will strengthen child-based programs (136, 140, 144). Given the discussion above, this thesis considered that school-aged children have the capacity to make decisions around food.

Cognitive development occurs in stages and impacts on a child's decision-making capacity. Three schools of thought towards psychology and education have been reported; romanticism-maturationism (innate and pre-determined), cultural-transmission-behaviourism (a direct transmission from stimulus received externally) and progressivism-cognitive development (interactions between internal and external stimulus) (141). In line with the public health approach in this thesis, the latter psychological school of thought about cognitive development was adopted as it recognises links between the individual and their environment.

Piaget (141) was a Swiss clinical psychologist and known for his seminal work in child development. Piaget aligns his theories with the progressivism-cognitive development and is well known for the Theory of Cognitive Development (141, 145, 146). He developed four stages of cognitive development; sensorimotor (0-24 months), pre-operational (2-7 years), concrete operational (7-11 years) and formal operational (11- 15 years) (141, 145). The two stages most pertinent to this thesis include concrete and formal operational. Movement from one cognitive stage to the next is fluid, meaning children do not turn 11 and then automatically switch to the formal operations stage (141). For some children, the transition between stages will happen before age 11 and for some it will be into their adolescence. Piaget's theory suggests that the stages are a continuum and a child does not skip a stage (141).

The concrete operational stage describes a period where children develop the ability to think logically in concrete ways (145, 146). When children are problem solving, the actual event or object needs to be present (145). In addition, children start to question their world ('why' does this happen and 'how come' we have to do this), their egocentrism reduces and they start to make generalisations about their world through observation (inductive reasoning) (141). For example, if asked to determine what comes next in a pattern, a child will look for similarity of the object in the pattern before rational similarity (a sequence) (147). In approximate terms, this stage represents children from grades one to six in an Australian primary school and is the stage where most of the children who participated in the study fit.

The formal operational stage is where more complex thinking develops (145, 146). As children move into their adolescent years, they begin to evolve their capacity to think in different ways. The ability to think of hypotheticals and consider other points of view, while reasoning from known principles and facts, begins to form (146). Abstract thinking increases during this stage, which involves the ability to manipulate self-generated thoughts to make generalisations, including possibilities and consequences, in the absence of a sensory input (147). An increase in working memory and relational knowledge is also seen (147). In approximate terms, the concrete operational stage represents children from grade six into high school.

The relevance of highlighting the grades where cognitive development occurs is because this literature review does incorporate studies with high school students. All childhood studies have constructs relevant to this thesis; however, differences in cognitive development is one reason why the outcomes from high school studies are not comparable or transferable to primary schools.

At what age can children rationalise their food decisions?

As discussed, from a young age children start making decisions for themselves (134, 137). As children increase their ability to communicate, they are able to use verbal and non-verbal cues to make their choices known, including pester power and tantrums to enforce their choice. The food industry is aware that the market for children's food, and the influence children have over their parents to purchase particular food, is growing (148). In recognition of a child's ability to rationalise food decisions, the food industry conducts consumer tests with children for product development (148). However, information from these tests are not published. Once children move into primary school, parents are still responsible for providing lunches for their children in most Australian schools; however children ultimately choose whether they eat the food offered to them or not.

For example, to understand more about children's approach to food choice in order to learn what can influence choice, Wansink et al. (69) studied children's views about why certain foods were not chosen or consumed. Information identified by the children was then used in an intervention that addressed the barrier to eating fruit, which was making it easier to eat and less messy (69). The intervention successfully influenced children's intake of the fruit (69). Wansink's research highlighted that children are able to articulate their parameters around food choice and adults can then use that information to provide a healthy option that fits within children's choice parameters. These findings support other researchers who report that young children can rationalise their food decisions (65, 134, 137, 143). However, further testing is required in Australia given the difference in lunch models.

Food choice can be categorised into decisions based on what, when or how much food is chosen. As children move through their first years of life, the extent of engagement into the what, when and how much food they consume increases. By the time a child reaches primary school, they are more involved in all categories of choice. Several investigators have studied various elements of food choice.

How do we know that a food choice is important for children?

Several investigators have attempted to answer questions around food choice and children. The following research investigated different aspects of food choice to show that providing choice within the context of a healthy food environment is central to creating good habits. The research presented investigates the consequences of restricting or controlling food offered to children, allowing self-selection, providing free access to unhealthy options, involving children in food decisions and the effect of the environment on food choice.

One of the earliest theories located about children and food choice was the ‘wisdom of the body’(143). Although the theory has been introduced previously, it is worthy of looking into in more detail. The theory is based on children being encouraged to self-select what and how much foods they eat which results in a high-quality diet and habits. While the original report of Davis (42) could not be accessed, Strauss (143) provides a peer-reviewed account of Davis’ well-known experiment. Her rudimentary experiment included 15 infants whom she cared for in an orphanage and she tracked their food intake, bowel motions and other growth measures. Her claim was let “children do for themselves” (143). Davis provided the food and the children decided if they ate and how much. Her research showed that children were healthy and had good eating habits when given no restrictions on the intake of the food provided (143). One important factor acknowledged by Davis was the food she provided was healthy and the theory would not necessarily translate if several unhealthy options were available (143).

In 1999, Fisher and Birch (29) investigated the relationship between maternal restriction of certain foods and the children’s intake of such foods when given unrestricted access. A multi-component approach (including questionnaires, interviews, observations, body composition measures and food measures) was used to establish that openly restricting access to particular foods does not appear to translate into a moderate intake when given free access (29). Being able to moderate one’s intake is part of creating a habit and placing a constant restriction on certain foods does not appear to support the formation of a healthy habit. This concept has similar findings to several papers that explored the restraint theory in adults (64, 149-151). The restraint theory describes that the ‘self-imposed restriction of foods’ in adults can predispose an individual to over-consumption (29, 64, 149-151). Overall, Fisher and colleagues (29) used a comprehensive and robust approach to exemplify the idea that restriction of certain foods does not translate to self-regulation and a moderate consumption of such foods if they are offered freely. The negative effect on a person’s relationship with food and eating caused by disproportionate control, restriction and pressure placed on what to eat has been acknowledged by several other researchers in the field including, Scaglioni et al. (32), Polivy (150), Heatherton et al. (64), Strauss (143) and Satter (65).

Scaglioni and associates (32) completed a review of how different parenting approaches affect children's nutritional behaviour. They looked at two aspects of control in a systematic review of the literature (32). The first was restriction of and control over the intake of unhealthy food. The second was parental pressure towards children to eat healthy foods, often with a reward of unhealthy food (32). The evidence indicated that extreme restriction or pressure over food intake might be a causal factor in children's poor eating habits and diet quality (32). In a second review, Scaglioni and colleagues appraised a range of evidence to conclude that excessive parental control over children's food choice has a negative effect on children's food acceptance (31).

Satter (65, 125, 142) has published extensively about children's eating and feeding behaviours; in particular exploring the negative effects of excessive parental control over food choice. Her research led to the development of a the DOR (65, 142).The work considers the negative effects on children where there is parental control over food choice, which can reduce nutrition quality, reduce the ability to self-regulate and results in a diet of reduced quality (125). The paper claims that if children have been raised with restrictions over food choice then these negative effects on choice is likely to be carried through to adulthood (125). Her research also supports that, in the context of a healthy food environment, children should be able to decide if and how much they eat to support the creation of healthy eating habits. Satter's work supports other research conducted in the home and school setting which highlight; having choice within a range of healthy opportunities, whether it is food or physical activity is important (152); parental restriction may reduce the ability to self-regulate (153); parental control over a child's eating can reduce the child's ability to use their own hunger and satiety cues (65); and restriction of 'palatable foods' may actually promote that food (29).

It is important to note that this research is not insinuating that providing free access to predominantly unhealthy food is a recommendation either. Beets and colleagues (132) observed that when given healthy and unhealthy options together, most primary school children opted for the unhealthy choices. The setting was out-of-school in a vacation care situation, with observations each morning and afternoon tea over 10 days. Snacks were offered in three different combinations (healthy, unhealthy and a mix of healthy and unhealthy). When given the third choice of either healthy or unhealthy options, children opted for the unhealthy option. Choosing unhealthy food when available has been shown in other studies also (27, 28, 100, 154). In context, it appears that children need choice, but from an environment of largely healthy foods.

Thus far, it appears that choice is imperative to develop healthy eating habits. However, free access to all foods is not conducive to support healthy food behaviours. The amount of food choice given to children is a complex question as it depends on many factors. Hanks and colleagues (133) stated that the removal of food choice will evoke a negative response amongst children. They used a concept called libertarian paternalism to influence a positive response to choice amongst high school students (133). Libertarian paternalism does not seek to infringe on people's liberties, rather, this concept leads students to choose healthier foods even when faced with less healthy choices by providing a supportive and encouraging environment (133).

Hanks's research used environmental cues - such as changing the lunchroom to increase the convenience of purchasing fruit and vegetables, providing an express lane for healthy options, promoting healthy foods only and verbal encouragement at the counter - to encourage students to make healthier choices (133). The research showed the likelihood to choose fruit increased by 13 per cent and vegetables increased by 23 per cent (133). In addition, after the intervention there was an increase in consumption of the whole food serve of fruit by 18 per cent and vegetables by 25 per cent (133). Therefore, environmental cues at the point of purchase could be helpful supports for children to make a healthier choice even when faced with less healthier options.

The investigation of libertarian paternalism was tested in a lunchroom that mimics a sit-down meal (as opposed to a canteen situation) amongst high school students (as opposed to primary school children), which is different to the context of this study. As discussed previously, high school-aged children are at a different stage of cognitive development and thus outcomes from studies cannot be generalised to primary schools. Nevertheless, the concept does portray the potential of retaining choice, while still improving which foods are chosen. In contrast to research previously discussed (29, 132), Hanks et al. (133) have shown the positive effect of food choice, in a supportive environment, on the purchase and consumption of vegetables and fruit in the presence of unhealthy options. Overall, many studies support that importance of having choices with many healthy options available in a supportive environment to encourage children to partake in healthy eating behaviours (65, 155-157).

2.5.2 Food choice within the school setting

Although this research was conducted in Australia, and despite the different lunch models adopted globally, viewing international evidence provides a broad perspective of evidence about food choice within the school setting. It should be noted that the translation of research about lunch delivery to all schools in general, as discussed below, is limited. There appears to be three main school lunch models used around the globe. Whilst 194 countries exist worldwide (158), the information below is based on 38 countries and one continent (159-161);

1. The most common model provides hot lunches for students in a room where large communal tables are set-up for sitting down and eating meals (66, 159-162). Meals are often offered for free or at a heavily subsidised cost (160, 161). Commonly there is no money transaction at the point-of-sale (160). The United Kingdom (163) and the United States of America (162, 164) follow this model. After exploring school lunch models used across 38 individual countries, 26 of these countries (68 per cent) also incorporated school meals free or at a subsidised rate for a selection of students (160). Most countries also allowed lunch to be bought from home but it was not the main model (160). Finland and Sweden (66) are two countries that provide all students a free meal and lunch is not able to be bought from home (160).

2. Some countries structure their school day to finish early in the afternoon (160). Many students in these countries go home for lunch (160). Amongst 38 countries, four fitted in this category (Spain, South Africa, Germany and Brazil). However, Spain, South Africa and Brazil also have the above system available (see point one).

3. In the last model, children mainly bring a packed lunch from home with many schools offering a canteen or tuckshop (26, 100, 160). Only eight countries out of the 38 reviewed were found to follow the latter model, one of which was Australia (159, 160). Many schools offer a canteen or tuckshop where-by children can order lunch and also purchase food over the counter at recess and lunch (26, 160). Eating is often transient; children sit for a short time outside, often on the ground, to eat lunch with a focus on playtime. This model is more similar to a take-away shop with a vastly different transaction process compared with a pre-ordered meal that is free or heavily subsided. For children this is also an introduction to the commercial world as money transactions are involved.

Food choice and lunchtimes

An example of providing a hot lunch to students is found in Gothenburg, Sweden (66). Project MEDEL, Måltiden – En DEL i lärandet which translates as 'the school meal is part of education' commenced in Gothenburg in 2011 (66). As there are no reports available in English, a document written by the Glasgow Centre for Population Health (GCPH) was used to learn about this project (66). The project philosophy was that a good meal sustains the mind and body. Staff and students regularly met with the chefs to plan the menu (66). They all sat together to eat with plenty of time, then they all cleaned the tables together. Free lunch meals for students have been ingrained in the Swedish culture for over 50 years (66).

GCPH reported that the MEDEL project successfully engaged the students in decisions about what healthy food is offered for lunch and as a result, healthy eating in the school environment was improved (66). Although details about the study design or outcome measures were not accessible, GCPH documented that establishing a social norm around healthy food environments within the school setting has positive effects on eating behaviour.

The concept was later used by GCPH in a pilot school project to recreate this communal sit-down atmosphere with teachers and students, to improve food choice and intake of healthy food (66). Whilst the approach to lunches in Gothenburg is interesting, one acknowledges that the outcome measures are somewhat vague, and the context is vastly different to Australia. It does indicate the potential for a healthy food environment within schools to become the 'norm' and that engaging students in decisions about what food to offer is a positive influence on healthy eating. Within that healthy food environment where students are included in the process of creating that environment, children are making healthy choices (66). The MEDEL project described here has similarities to the research undertaken by Hanks et al.(133), which was described earlier. Both show the positive effect of providing choice to students, except Hanks et al. provide a more comprehensive evaluation and report.

In Australia, Rana and Alvaro (26), demonstrated that canteens can successfully implement a change in the canteen to offer more healthy options. Rana and Alvaro (26) assessed the effectiveness of the 'CR**EAT**E *healthy eating in schools'* program to increase healthier food and drinks within the food environment in South Australia. Part of the program was to provide children with the opportunity to access healthy choices daily and ensure consistency of health messages taught in class with food choices offered to students (26). They found a correlation between the messages taught in class about healthy eating and the necessity to offer regular healthy choices that match such messages. The researchers proposed that a consistency of messages is required in order to improve the eating habits of children (26). Although this study showed that a healthy food environment can be achieved, it did not investigate consumption of the healthy food options available (26).

Likewise, Tasmania has successfully implemented healthy options in the canteen; 52 primary and high schools are accredited through the Tasmanian School Canteen Association (TSCA) (37). However, the TSCA has no published literature to demonstrate a change in the choice and intake of the healthy food options available. It has been established that the healthy food environment is important (155-157) and local programs demonstrate that a change in environment within the school setting is feasible.

Despite the differences in lunch provision across the globe, the evidence thus far supports the idea that choice within the context of a healthy food environment is important in a school setting to create a supportive environment, which provides an opportunity for children to choose healthy food options (50, 55). However, children have not been central to our understanding of their motivations behind food choice. A more child-centred research design is required to extend the understanding about what influences children to translate availability of healthy food to consumption (see Section 2.5.1).

The discussion in this section has explored the ability of children to make a choice, as well as the relevance of providing healthy food choice within the school setting. The next section will provide a deeper understanding of literature relating to the school setting as a base to create food environments that promote healthy eating behaviours. A particular focus will be on the school canteen, which is the main provision of food to children in schools aside from lunchboxes brought from home.

2.6 Promoting healthy eating behaviours in schools

A settings-based approach has become a popular and effective way to target health promotion that creates supportive environments (5, 8, 72, 79). There is consensus in the literature that using a whole-of-school approach to create healthy food environments in a primary school setting provides support for positive behaviour change amongst this age group (5, 68, 79, 165). However, it remains inconclusive how to strengthen the impact of a supportive school environment to maximise the effectiveness of programs.

2.6.1 The school setting

Schools are considered an ideal setting to support children to establish healthy eating habits early in life (61, 67, 72, 166). Children have regular contact with school for their first two decades of life, so they are a captive audience (25, 26, 68, 72). In Australia, children eat about one third of their daily intake at school (over two breaks), hence maximising the quality of nutrients during school is important to consider (18, 165). Finally, to support the development of healthy eating habits, students require repeated exposure to messages that are consistent and corresponding across the school food environment (26, 100, 166, 167).

Health promotion approaches conducted in the school setting target a range of aspects in the school food environment, including; whole-of-school approaches (26, 70), policy (166), nutrition training for teachers (168), school architecture (165), repeated exposure (169), peer modelling (169, 170), rewards for trying new foods (169, 170), multiple environment factors (72, 171) and canteens (61, 69, 172, 173). Regardless of the intervention focus, the school setting provides a prime time to work with children to improve their eating behaviours, given the continuous and regular contact that schools have with children from the age of around four years of age (22, 25, 26, 67, 68, 70, 90) .

2.6.2 The food environment in schools

Supportive environments across a range of settings can assist people to make healthier food choices (4, 55, 107). Establishing supportive environments in schools, through the implementation of primary prevention activities, is acknowledged in the literature (25, 67, 68, 165). The food environment can enable children to experience food and food choice (79, 174, 175). Children's food experience at school is important to develop healthy eating habits (22, 90). Elements of the school food environment explored in this review include; a whole-of-school approach, policy and other aspects of the environment such as training for teachers, curriculum, classroom activities, school community, physical infrastructure and the canteen (26, 79, 165, 168, 176).

Whole-of-school

A whole-of- school approach to improve the health of students is widely accepted globally (26, 70, 71, 167, 177). Engaging with key stakeholders (including government agencies, community, parents, teachers and students) is recognised as an important element for successful implementation of whole-of-school interventions. Early involvement of stakeholders can secure commitment for the intervention (70, 167), allow planning for sustainability through community development and capacity building (167, 177), and ensure consistency of health messages across the school setting (26, 70).

Consistent health messages relate to credible and current information being provided and practiced across the whole environment: policy, curriculum, classroom activities, the school community and in the canteen (26, 100, 167). While the values of incorporating students in health promotion programs within the school is documented in many studies, very few detail what this means in practice. The inclusion of policy, class activities to match health education and supportive school environments were also described as key elements for a successful whole-of-school intervention (70, 167, 174, 178, 179).

Despite the positive attributes reported, there does not appear to be one standard approach that can predict a sustained improvement in students eating behaviours. This is possibly due to public health interventions occurring in a real-life context, without controlled variables found in randomised control trials. Given that life is complex with variables that regularly change, a common set of principles to guide public health interventions (rather than attempting to control variables) provides the flexibility that fits with a settings-based approach.

In a study that reviewed attributes of successful whole-of-school interventions, Skar and colleagues (70), in 2015, reported that active early engagement of multiple key stakeholders, including children, was crucial for successful implementation of such programs to evoke change. Although the extent to which students were used as change agents in the whole-of school intervention was unclear, the study emphasised that health education alone is not enough to change behaviour (70). Their conclusion was similar to other research that a whole-of-school approach is required as a guiding paradigm to support positive behaviour change in the school setting (26, 70, 71, 165). Similar to Skar et al., Rana and Alvaro (26) reported that health education should be undertaken alongside practical activities and the information should be consistent and connected. Skar et al. (70) and, in the same year, Lewallen (71) also identified that government support and the physical environment should be considered, which is reinforced by researchers de Silva-Sanigorski et al. (167) and Frerichs (165).

In recognition of the widely accepted whole-of-school approach, the US Centers for Disease Control and Prevention, along with the Association for Supervision and Curriculum Development, came together to create a unified approach to health and education development (71). The 'Whole Community, Whole Child' model represents a systematic and collaborative approach to health and learning, recognising that the two entities are linked (71). The model views children as the focal point, surrounded by a healthy school environment (71). Similar to Skar et al., the model recognised the importance of links with family and community engagement (70, 71). Although the model's effectiveness has not yet been tested, it shows there is international unity that a whole-of-school approach is an important starting point.

Another Australian whole-of-school intervention, called Kids Go For Your Life, was part of a larger community based program called Romp and Chomp that targeted overweight and obese children under five years of age, in the state of Victoria, Australia (167). The main aim was to use a whole-of-school approach to increase active play, fruit and vegetable intake and water, and to decrease screen time (167). Overall, the Romp and Chomp intervention showed an improvement in eating behaviours, among other objectives (180).

However, it was not possible to attribute the success to individual components of the intervention, such as 'Kids Go For Your Life', as it was community wide and multi-faceted. Researchers reported similar elements for success when adopting a whole-of-school approach; engaging key stakeholders that will support change and continual reinforcement of consistent messages across the whole environment (167). In addition, implementation of a healthy policy and capacity building with teaching staff were reported as important components for cultural change that will support a healthy food environment (167).

In all of the research described, there is support for a whole-of-school approach to promote health that engages children and other key stakeholders (26, 70, 71, 167). Most studies have investigated the feasibility of creating a healthy food environment. Overall, changes to eating behaviours, including the food choice practices of children during school-time, are less defined.

Policy

Policies can shape opportunities for people to make healthier choices (43, 51, 181, 182). Policies in the school setting have been recognised as a critical component to support healthy school food environments (70, 178, 180). Established literature has shown the importance of not only implementing nutrition policies within the school setting, but evaluating them as well (79, 123, 166, 174, 178, 179, 183). While knowledge about the feasibility and successful implementation of policy is imperative, understanding the impact healthy school policy has on behaviour change is equally as important. Evaluation of school policies and documentation about the impact on eating behaviours within a school food environment is less defined (178, 184, 185) .

Sanchez et al. (178) examined requirements for successful school nutrition policy implementation in New Mexico. The common theme for successful implementation of policy, reported by school administrators, was similar to the research that used a whole-of-school approach (178). Engaging with key stakeholders - government agencies (to facilitate implementation, training and funding), the community, teachers, parents and students - were reported as essential components (178). Themes that emerged from the focus groups with students revealed that they considered different factors when discussing policy success. They found the school food unappealing and lacking in variety, quality and choice (178). This suggests that policies should also consider factors reported by children as they differ from school administrators.

In Texas, Cullen and Watson (183) evaluated the impact of a nutrition policy in schools but they measured the change in availability *and* sales of foods. While there was no statistically significant difference between fruit and vegetable options offered or sold during that time, there was a statistically significant reduction in amount of unhealthy items offered and sold (183). A similar observational study by Arcan et al. (186), in the United States, also showed no change to vegetable consumption after the implementation of the updated National School Lunch Program policy but fruit and whole grain intake did significantly increase. Overall, results support that school policy can drive a healthy change to the foods offered within the school setting (183, 186).

Similarly, in an Australian study, Pettigrew et al. (166) endeavoured to evaluate the implementation of a state-wide school policy, the Western Australia Healthy Food and Drink policy. Even though the study reported that key stakeholder engagement was imperative for the smooth implementation of the policy, information was only accessed from principals (166). Principals were in support of the policy and reported an improvement in the healthiness and quality of menu items (166). Notably, self-reported menu appraisals are not a reliable measure of policy effectiveness (184, 187). The principals were also asked about the change in student satisfaction and the proportion of the students using the canteen was based on the memory and perceptions of the principals (166). Children did not participate in the answer to this question.

Despite the limitations, different countries and different systems, Sanchez et al. (178), Cullen and Watson (183) and Pettigrew et al. (166) are confluent that a policy to support the school environment can foster healthy behaviours, the evaluation of policies in schools is lacking and stakeholder engagement is imperative.

Other studies that have evaluated the efficacy of implementing a policy within schools have also shown an improvement in the healthiness of school menus, through a reduction in the sales of unhealthy foods, but not necessarily an increase in healthier options (187, 188). Hills et al. (187), in the Australian state of NSW, used menu assessments to measure the implementation effect of the mandatory NSW Fresh Tastes @ School strategy that aimed to increase the number of healthy options on school canteen menus (187).

Despite a positive change in the healthiness of menus, most menus continued to sell unhealthy options (187). The study concluded that menu assessment is more reliable than self-reported data from staff about menus and while the use of policies in school has potential for change, more support for schools is required to secure compliance of food and nutrition policies (187).

A different research group in NSW used a single-blinded parallel group randomized trial, using a range of menu audits with direct feedback over a year, to test policy compliance (188). All primary schools who participated were in rural or remote locations of the Hunter Valley and did not comply with the Fresh Tastes @ School policy (188). Like other studies, results did show an increase in the number of schools that removed unhealthy food from the menu but no difference in the amount of healthy food offered (188). Canteen managers identified that the time required to participate in the auditing process was a barrier and this could have been part of the reason the intervention was not delivered to the extent it was planned (188).

In recognition of lengthy auditing processes, Reilly et al. (184) have recently developed a reliable and valid tool to measure policy compliance. The tool proved to be quick, valid and low in cost (184). It seems that while there is potential that nutrition policies can support healthy eating habits, more research is required to find the appropriate support for schools to put policies into action and then evaluate them.

Nathan et al. (189) addressed this issue by identifying and collating barriers to policy implementation, then went on to test whether policies were more effective if the barriers were changed to enablers. A range of elements for successful policy implementation were identified and align with other research reported in this literature review; support from the school principal, resources, on-going support, evaluation and feedback, recognition and training for canteen personnel (189). Schools who considered these elements were more likely to have no unhealthy foods and an increase in healthy foods on their menu compared with control schools who did not use any of the identified enablers (189). The study did not measure if the change in healthiness of the menu translated into a change of purchasing of healthy options, nor did it involve the students in any way.

There is agreement across the literature that a commitment from the school is required for successful implementation of policies (185). Other factors include key stakeholder engagement (especially students), policies that are easy to understand with clear roles and responsibilities and a commitment to evaluate the effectiveness of policies to create healthy food environments and improve eating behaviours (185). Policy evaluation should also consider the impact of other school environment components, such as school architecture, repeated exposure and peer modelling. Building healthy policy is integral to the translation of research and theory to practice. In relation to the school setting, it also ensures that change can become engrained in the school culture by providing long-term commitment. However, it is not clear from these studies and others, if school nutrition policy does in fact translate to healthier eating (179). More high quality research is required to establish how to improve policy compliance in the school setting and the impact a healthy food environment has on children's food purchases.

Other aspects of the food environment

Many studies have targeted particular components of the school food environment, rather than a whole-of-school approach. A range of the most current research with a focus on improving eating behaviours are explored below. Areas of research discussed below that aim to improve eating behaviours among students include the feasibility and effectiveness of nutrition training, school architecture, repeated exposure, peer modelling and approaches that target more than one aspect of the food environment within the same intervention.

Public health approaches acknowledge that behaviour will change when interventions target the individual and environment, as an individual's behaviour is linked to their environment (176). In the context of a school setting, this translates to interventions that provide nutrition education in conjunction with creating a supportive environment, rather than relying solely on nutrition education or environmental change alone (176). To test the theory in a school setting, a quasi-experimental study compared an intervention with nutrition education and environmental change (with a focus on the cafeteria) versus environmental change alone versus no intervention (176). Significant improvements were seen immediately after intervention and one year post intervention in vegetable and wholegrain consumption among students who received education *and* a supportive cafeteria environment (176).

It is important to note that results based on self-reported data have been shown to be a poor proxy for collecting information about consumption unless strategies are included to reduce reporting bias (176, 184, 185) . However, given that data was collected the same way across all groups and the statistical significance was so pronounced, the study lends support to the theory that approaches need to combine individual and environmental aspects. The theory also supports the need to integrate translational knowledge and consistent messages across the whole school food environment (100, 176, 179). Similarly, capacity building through nutrition training to teachers and food service staff, in combination with creating supportive environments have also resulted in improved school food environments (26, 71, 72, 168, 180).

Another concept that has been previously discussed in this literature review relates to rewarding children with unhealthy food, which sets children up with a positive association to unhealthy food (29, 105). Nutrition training for teachers has been shown to reduce the use of unhealthy food rewards in class (168). The Bright Start study, in the US, aimed to use nutrition training to improve food practices in the classroom and this data was compared to schools who did not receive training (168). The intervention group changed their classroom practices significantly by reducing the use of unhealthy food as a reward in class (168). Although it is the connection between a range of components in the school environment that create a health-promoting school system (179), it is important to understand how each component contributes to the whole environment. The positive effect of nutrition training for teachers has been reported elsewhere (72).

In contrast, non-food rewards have successfully influenced children to try new foods (170, 190, 191). Based on the reinforcement theory, in which rewards can be used to reinforce a desired behaviour (169), Lowe at al. (170) conducted a study with three British primary schools, aiming to increase fruit and vegetable consumption. An intervention using non-food rewards, in conjunction with peer modelling and repeated exposure, successfully increased fruit and vegetable by 2.36 serves per day (170). The contentious issue of using rewards for food intake was acknowledged and variables were measured independently. These measures showed that rewards alone was not as effective to change behaviour compared with the combination of variables (170). The research group emphasised that rewards do not have a negative effect when conveying positive messages that did not have a coercive connotation (170, 173). Lowe et al. (170) formulated a robust and multi-layered approach, emphasising that it was the combination of rewards, exposure and peer modelling that led to the success. Children were engaged in establishing a range of rewards that were appealing, which was another important aspect that authors thought contributed to the success compared with other similar programs (170). The outcomes of this smaller scale research led to the development and implementation of 'Food Dudes' in England, Ireland, Sicily and California (169).

More recently, Redden et al. (192) trialled two separate school-based interventions to test the theory that if vegetables were served in isolation to other options, and before lunch was served and consumed, students would eat more vegetables. The first pilot study used carrots as the test vegetable and the second intervention, that had three test days, as opposed to one, used broccoli (192). Both interventions showed a statistically significant increase in vegetable intake when children were offered the vegetable prior to having lunch (192). Similar results have been documented elsewhere (193). The intervention was simple, low cost and non- invasive. Redden's study resulted in an increase in healthy food without rewards, encouragement or peer modelling (192). It is possible that part of the success of the previously described 'Food Dudes' (170) is due to the same phenomenon as Redden's study, given that the fruit and vegetables in that study were offered to children prior to the first meal break.

To add to the debate, Hudgens et al. (191) showed a significant improvement in healthy food choice and consumption using non-food rewards. This study in an elementary school offered a 'Power Plate' - with a fruit, a vegetable and plain milk – as part of the lunch service. If children chose a 'Power Plate', they got a non-food reward (191). There was a 300 per cent increase in selection of the plate and plate waste remained constant, inferring that the food was being consumed (191). Thus far, while there are some effective interventions emerging that positively influence healthy food choice, it is unclear exactly what variable is effective. It would be advantageous for a better understanding about what is working for future interventions by asking the children why the approaches are successful.

The program 'Food Dudes' also reported that the peer modelling was one of the successful variables (169). While other studies recognise the influence of peers on children's intake, Hanks et al. (194) documents that conventional marketing techniques are as equally successful for encouraging healthier behaviours in the school setting. Both Lowe and Horne (169), and Hanks et al. (194) achieved more positive eating behaviour change by using a short video with characters linked with vegetables; such as older children who get powers from vegetables and vegetable characters that are strong. 'Food Dudes' did show a change in actual consumption, as opposed to just choosing food from the salad bar as measured by the research by Hanks et al (194).

In the same vain, Joyner et al. (195) used the 'FIT game' with similar characters as described above and a good versus evil narrative. The study aimed to increase the intake of vegetables in the school setting (195). Schools had the story either on a poster (changed manually) or on a flat screen in the cafeteria (195). If students collectively ate the target level of vegetables, they would move to the next episode (195). While the intervention was resource intensive, it did create an increase in vegetable consumption (195). The study did not measure if the increase in vegetable consumption was sustained or how many episodes would be required for a sustained effect (195).

Overall, Lowe and Horne (169), Hanks et al. (194) and Joyner et al. (195) used a similar concept and age group with positive results. The gap in the knowledge is to understand from the children's perspective why the approaches worked to allow a deeper understanding about which elements of the intervention actually influences their food choice.

Many studies conducted in the school setting follow a similar theme, where by students are not engaged in the effort to unravel how to improve student's food intake. Frerichs et al. (165) conducted a review of studies investigating the physical environment in the school setting, namely the school architecture. Apart from discovering a range of physical attributes that contributed to a supportive healthy food environment, there were other common themes uncovered from students (165, 179). The article reported that involving staff, parents, the community and students was a more effective approach than targeting one of these groups alone. Other strategies identified by children to increase their intake of healthy foods included: easy access to healthy options that did not require lining up for food, more time allocated to eat lunch and more involvement in designing the school food environment (165, 179). These findings were supported by Baur et al. (196), who held focus groups with students and found easy access to unhealthy options and short times allocated to eat were two barriers to healthy behaviours.

Thus far, many aspects of the school food environment are integral in the promotion of healthy eating at school. A multi-strategic whole-of-school approach provides more effective changes to the school food environment and behavioural change, compared to a focus on isolated components of the environment (179). Providing consistent messages across several layers within the school system, which targets individuals and the environment, aligns with a socioecological approach. However, while much of this literature agrees that children are key stakeholders, students have rarely been directly involved with providing information or engaged with the planning of interventions that aim to change their eating behaviours.

2.6.3 The canteen

The canteen is central to the research for two reasons. First, in a school setting the canteen is the centre of food provision for most schools. To create a consistent and cohesive food environment, the canteen becomes the conduit for translating healthy messages taught in class into practice. Secondly, given the cognitive development phase of primary school children (discussed in section 2.5.1) they need a physical object to relate to when exploring a topic.

During primary school, most students are concrete thinkers and not able to think in hypotheticals (141). Although the canteen is not directly related to the research question, the canteen provides the students context to provide a rationale for their food choice. If the students are able to provide a rationale for their food choices, the canteen will also become the central hub for translating findings into practice within the school setting.

The school canteen, also referred to as the school tuckshop or cafeteria, is the main outlet for children to access food in the school setting (79, 184). In several international studies cited in this literature review, school lunches are provided to children free or at a discounted rate (175, 197). In Australia, children take a packed lunch to school but many primary schools also offer a canteen for lunch orders and open during the breaks so children can purchase food. Most children use the canteen when available at school (17, 26, 68). Thus, the canteen is a central component of the school food environment and used as a point of reference in this study. The research presented in this thesis intends to describe the decision-making process of a child around food choice, from a child's perspective, within the context of the school canteen.

Globally, children using the school canteen choose predominantly unhealthy food, even with healthy food available (17, 27, 68, 179). A substantial number of studies globally report that manipulation of the food environment can influence what children eat. Further, a healthy food environment increases the likelihood of children choosing healthier options but these changes are modest (26, 69, 100, 173, 175, 198). Most of the school studies that have looked at children's food choice have been outside of Australia, where the lunch model is different. In Australia, several studies have focused on the feasibility of creating a healthy school canteen. These studies all highlight the complexity of finding a process that is effective for making healthy food available *and* influencing children to choose healthy options. Further research is required to discover how to achieve a sustainable increase in healthy food consumed in the school setting.

As discussed earlier, two elements of choice relate to children's eating behaviours; what choice children are provided (availability) and what children choose to eat (purchase). Providing choice is an important element to create healthy habits. The negative effect of food restriction discussed previously (section 2.5) will not be detailed again, except to emphasise that restricting food does not translate into longer term healthy habits and can increase desire for that food (109). The other aspect of choice that is crucial to consider is what drives food choice for children. Understanding factors that influence what children choose and eat are essential to develop strategies that support children to make better food choices. This section considers a range of evidence that focussed on the feasibility of integrating such guidelines into canteens (availability), with fewer studies looking at what food children choose (purchase) as a result of interventions aimed to improve healthy eating (175). Other studies relevant to the canteen are included as well.

Availability – provision of choice to children

Exploration of the school food environment has resulted in an increased knowledge about barriers and enablers for creating a healthy school system, from the classroom (knowledge), through to the canteen (putting knowledge into practice). Drummond and Sheppard (179) investigated how school staff, parents and students viewed the role of the canteen in the school setting. While there was no consensus among parents and canteen managers about the role of the canteen in the school, teachers agreed the school should offer a range of low cost healthy foods (179). From the canteen manager's perspective, they prioritised foods that sold well and were easy to prepare, which are mostly unhealthy foods (179). Interestingly, students reported that the lack of variety and high cost of healthy options were a barrier for choosing such foods (179). The study also reported that school staff recognised that many choices available in the canteen undermined the health and nutrition messages taught in the classroom (179).

Similarly**,** Cleland et al. (27) aimed to understand the role of canteens in Victorian schools, Australia. The study explored what foods children purchased from the canteen, children and parent knowledge of healthy foods, perceptions around the role of the canteen in health promotion and the perceived barriers to eating healthy foods in the canteen (27). As reported in other studies (28, 100), Cleland et al. (27) found that children regularly use the canteen and purchase unhealthy options in preference to the purchase of healthy food. Despite a different data collection method, the enablers discovered were similar to Drummond and Sheppard (179). Parents and teachers felt that more healthy foods available, promoting these foods and reducing the cost were all identified as factors that would influence choice (27). Most comments in the literature about cost as a barrier for healthy eating has come from adults, not children (162, 179, 199). Neither study tested if implementing these enablers did in fact influence purchasing behaviours.

It has been established that providing and promoting healthier foods in the school canteen at a reasonable cost reduces barriers that have been recognised as prohibiting them to make healthy food choices (27, 179, 199). A range of evidence reports, while an improvement in availability of healthy options have occurred, unhealthy food is regularly available from school cafeterias and canteens (174). It is possible that this could relate to the higher cost of healthy items, given that was raised as a barrier for purchasing healthy items, which aligns with research that has shown healthier canteen items are also more expensive to supply (68, 200, 201). There is minimal consensus in the literature that increasing the availability of healthy options actually translates to an improvement in eating behaviours (172).

This raises two points. Firstly, it is recognised that some choice is imperative for a habit to form but there may be a ratio of healthy options versus less healthy options required to nudge children towards healthier choices. Secondly, if one considers food on a spectrum, with ‘red’ or unhealthy food at one end and ‘green’ or healthy food at the other, then the ‘amber’ food sit in the middle. Some ‘amber’ food are unhealthy options that fit in the amber category because of recipe modifications and alterations to portion size. Typical foods that exemplify this include pies, sausage rolls, hot dogs and pizza (202, 203).

A recent study has shown a difference between how dietitians classified a range of menu items without seeing the recipe details compared with how they were classified for the canteen (204). The dietitians in the study judged some ‘amber’ food (pie, hot dog) as a ‘red’ option because the two pies look similar. The food options that were assessed in the study were in fact classified as ‘amber’ food because the recipe had been modified to fit the ‘amber’ classification. It would be impossible to see the difference between a pie that is classified as ‘red’ compared with a pie classified as ‘amber’. In a canteen setting, how will children know the difference between an ‘amber pie’ and a red’ pie? This could be a point of confusion as to why some pies are promoted as good choices and others are not.

Purchase – What children choose to eat

The paradigm of creating healthy canteens as part of a healthy school environment is engrained. The next important step is to ensure the availability of healthy food translate to children regularly choosing that food from the school cafeteria or canteen (174). Perry et al. completed a study in schools, called Cafeteria Power Plus, to determine if altering a cafeteria environment would increase fruit and vegetable consumption among children (173). Strategies used to change the canteen environment included; promoting cafeteria food during class, increasing fruit and vegetables available at lunch, increasing access to fruit and vegetables, improving the appeal of food offered, verbal prompting and promoting student role models to access healthy food from the cafeteria (173). Whilst the results showed a statistically higher increase in fruit and vegetables amongst the intervention group, the increase was modest (0.14 serves) (173). Perry et al. (173) and Williamson et al.(175) note that more successful outcomes are seen in programs that link with nutrition education in class, give teachers and café staff more responsibility for increasing healthy options and include parental involvement.

One such study that did include nutrition education during class, in addition to food environment changes, was conducted by Song et al. (176). Significant changes were seen in vegetable and wholegrain consumption in the intervention group (who had nutrition education sessions and changes in the cafeteria) (176). The need to provide consistency between what is taught in the classroom and what is offered in the food environment is reinforced in these studies, and others (100, 173, 174, 176). Although the thoughts and ideas of students were not used to design the research, these studies imply there is potential to change behaviour among children in the school setting by creating supportive environments.

While the research reviewed has emphasised the importance of school canteen modification in nudging children's food choice towards healthier options (205), all of these studies were resource-intensive and while improvements were significant, they were moderate. Smaller pilot studies that require minimal resources, which focus on novel interventions, can inform larger interventions (57, 197, 199). Pittman et al. (197) used a novel and cost-free approach to influence choice in schools that used a sit down café-style lunch model. During the intervention phase, food staff identified the healthiest food and drink (plain milk) option each day, using stickers to make them obvious (197). If children chose one of the healthiest food items and plain milk for lunch, they were able to ring a bell at the end of the canteen line (197). This public recognition for choosing the healthiest food and drink created a significant increase in the number of students choosing the healthier option (197). Schools chose to continue with the low-cost strategy and positive changes in healthy food choice were maintained (197). Given the lunch model in Australia is so different, the concept would not easily transfer to the Australian school lunch concept without further feasibility testing; however, it does support the importance of small-scale studies to test novel approaches that aim to improve eating behaviours.

Other smaller scale studies have also used simple low-cost ideas to evoke a positive change in food choice. Hudgens et al. (191) used a small non-food prize if children chose a 'Power Plate' for lunch in primary schools USA. A Power Plate contained a range of healthy food items, which was promoted during class (191). There were no ramifications for not choosing the plate and there was no coercing from food service staff to choose the healthy plate (191). A significant increase in the number of children choosing the Power Plate to receive the prize was observed. The prizes were a collection of non-food items that the children decided on prior to the intervention (191). In another study, that intervened while primary school children lined up for lunch, the researchers' trialled an intervention where children were offered vegetables while waiting in the lunch line (193). This small and simple intervention had an impact on the total vegetable intake over the lunch period (193) and has been trialled elsewhere with success also (192). The research by Wansink et al. (69) has been described already but that was another simple strategy (a fruit slicer) used to address a barrier (the messiness of eating fruit) identified directly from the children.

Despite various approaches and levels of effectiveness, all studies are confluent that the canteen is central to the school food environment and children's purchasing practices can be influenced by changes in the school food environment, including the canteen. It appears that enablers for children to make healthy food choices that have been identified in various studies worldwide are similar; availability, advertising during class, reduced cost and simple yet effective solutions (27, 173, 176, 179, 192, 193, 199).

Many of these studies have been conducted outside of Australia, many studies within Australia have focused on making healthy foods available. Furthermore, the lunch model in schools is different in Australia (children bring lunch from home or buy it from a canteen, then sit in outside to eat it). As such, more research is required within Australia to measure the impact of healthy food environments on actual purchasing behaviours.

In summary, students often use canteens and choose mainly unhealthy options. Although canteens have healthy choices available as well as unhealthier choices, it is still the unhealthy options that are purchased in favour of the alternative. It can be inferred that the canteen is a central part of a healthy food environment in the school setting. In addition, it is possible that there is a ratio of healthy to less healthy choices available to evoke change. Such a concept aligns with the "Body of Wisdom" theory discussed earlier in the literature review. Creating consistency of health messages between all elements of the environment is an important starting point to support children to improve their eating behaviours. There is still work required to discover interventions that have a large positive impact on children's eating behaviours. The research discussed in this section also shows that there are gaps in the knowledge about children's decision-making processes around food as few studies have asked them directly.

2.7 What else do we know about children's decision-making around food choice?

This final section of the literature review splits into two sections; adult perspectives and child perspectives. The evidence presented will show that adults are not reliable proxies for reporting children's rationale for food choice.

2.7.1 Adult perspectives

As previously discussed in section 2.4.1, adult motivations for choosing food are the focus of some research groups. These motivations are not appropriate for extrapolation to children because of the difference in cognitive thinking processes. Studies have also asked adults about children's food choices and decision-making processes. People have assumed an adult's account of a child's rationale for making food decisions is accurate, which is potentially contentious. The research presented in this literature review show that adults are not always a reliable proxy for children about their decision-making criteria for food choice (69, 133, 206).

Adults in general

Factors that influence adult food decisions are beyond taste and liking of a food and include beliefs about nutrition, diet trends, perceptions about quantity of food they should eat, health consequences, how they feel about themselves and social norms (102, 150, 151, 206). Adults have also been shown to make food choices for their children based on factors including convenience of preparation and preventing waste as there is an assumption children only want unhealthy food in their lunchbox (18). Up to this point, the literature review indicates that children do not use the same decision-making process as adults (18, 69, 102, 206). Given the different cognitive level of adults compared with children in this research, adult studies will not be used as a guide for children's decision-making around food.

Parents

Parents have been used as proxies for what children think for years (35, 69, 165) but that does not mean their assumptions are reliable. Wansink and colleagues (69) collected the assumptions from a group of parents about why their children chose to eat fruit at school, or chose not to eat fruit. Comments were compared with their children views and in most cases, parents were incorrect (69). Bathgate and Begley (18) looked at factors affecting food choice through the lens of parents and carers. Parents assumed their children would not eat healthy options but parents also reported that they compromise on nutrition because of convenience of buying pre-packaged foods for the lunch box (18). Despite parents wanting their children to eat more healthy foods, they reported the preparation was inconvenient (18). Parents also reported a perceived high cost of healthy food. While stating their children would not eat healthy food, participants did not consistently offer healthy choices (18).

Other studies concur that parents are key in shaping healthy eating habits (172, 207), which can be driven by socioeconomic status and culture or social norms (207). However, this appears to change during primary school (35), where peers become more influential than parents do as children start conforming and desire to fit in socially (35, 100). Some studies have identified that children are the ones that can be influential at home, given their success with pester power (208). While it is crucial to engage with parents to be part of strategies that improve children's intake (177, 179, 209, 210), parents are not reliable proxies for what drives children's decision-making around food (69).

School staff

Numerous studies are available that have explored the views of principals, teachers, canteen or food service staff about what they determine influences children's intake, rather than asking the children directly. Slawson and colleagues (172) implemented a school-based project that was designed to establish what staff thought influenced children's food choice (172). Canteen staff believed school nutrition services were important (172). However, they thought parents influenced children's food choice, not the school (172). Staff felt they offered high quality healthy choices and reported that peer influence, negative thoughts about healthy foods, a lack of knowledge and limited exposure to healthy foods were reasons why children did not choose the healthy foods available (172). The teachers expressed only moderate confidence in the influence of canteen programs on food choice (172). The children were not asked if or how the canteen program influenced their food choice (172).

In contrast, other studies have shown that knowledge about healthy foods does not influence a child's decision to choose a food (27, 100). Research conducted by Gosling et al. (35) and Lowe et al. (170) report that canteen staff asserted that peers affect children's food choice, rather than parents, which concurs with studies reported earlier in the literature review. Other research conducted by Arcan et al. (168) claim it was the teachers own eating practices during school time that was influential on children's food choice. It should be noted this information has come from the perceptions of teachers and not children (168).

There is a lack of consistency and coherence in the literature based on school staff views about factors that influence children's eating behaviour. The inconclusive consensus about what is the key influence on children's food choice supports the idea that children are key stakeholders in the process of changing children's eating behaviours. Which provides further justification for this project that children's views should be included in the development of strategies to improve childhood eating behaviours (26, 70, 165, 167).

2.7.2 Children's perspectives

Several studies acknowledge that children are key change agents and informants for creating strategies that change their behaviour (35, 70, 100, 165, 166, 179). The number of studies that have translated this idea of including children's views into their research is limited. An exception could be the food industry who allegedly perform such studies but they remain as information for product development, not dissemination (148). Although research that has asked children directly about their rationale behind food choice is limited, there are key studies that have worked with children, which are described below.

Hesketh et al. (100) determined that the views of the children who participate in obesity prevention programs have been overlooked so conducted a study that asked the children. A number of themes emerged from the focus groups including awareness, contradiction between knowledge and behaviour, lifestyle balance, the local environment, barriers to healthy eating, contradictory messages and myths. Similar to other literature described earlier in the review (27, 68, 179), this research found that children could identify healthy and unhealthy foods; despite this most children reported eating unhealthy foods on a regular basis (100). Contradictions in explicit and implicit health messages were reported as barriers to healthy eating (100). Although the aforementioned study did not ask children why they chose particular foods to eat, they did establish that food advertising, contradictions between healthy messages taught and food available, plus ample availability of unhealthy foods were barriers to eating healthy foods (100).

Hesketh's work (100) also highlighted similar views recorded by other studies, which was an interesting theme around contradictory messages in the school food environment (35, 166, 167, 176, 179). Children were able to recall health messages taught in class and then identify that many foods offered in the canteen were the 'unhealthy' ones they learnt about in the classroom. It appeared the children believed that anything permitted at school is an indirect endorsement and inherently healthy. The dissonance between the overt and covert messages directed at children around healthy eating had caused indirect endorsement of some unhealthy foods and this has been recognised elsewhere (35, 166, 167, 176, 179).

In a pilot study, Wansink et al. (69) interviewed students to help establish reasons why whole fruit consumption was avoided. Parents had reported that children do not eat fruit because of price, taste preference or appeal of other foods, the research demonstrated that it was the inconvenience of size and the potential messiness of eating fruit that resulted in children avoiding fruit (69). Students indicated two main reasons for avoiding whole fruit; for younger children fruit can be inconveniently large and for older children it was the mess of eating them in front of others (69). Wansink et al. (69) then used a basic and versatile solution to support children's decision making by addressing the inconvenience and mess.

Liem and Zandstra (126) similarly looked at food preferences but with a cohort of children from Turkey. They found that smaller sized healthy snacks are preferred to larger sized snacks among primary school students (126). This is another example where simple and versatile solutions are available to address barriers that children report for choosing particular foods. These studies highlighted the need to be very cautious with adult assumptions as to why children make food choices and that by asking children directly, a simple and low cost solution was effective to change behaviour

In 2008, a study conducted in the United Kingdom, primary school children were able to describe what a healthy food means, and what influenced their food choice (35). While children were able to pick the very healthy unprocessed foods (fruit and vegetables) and the very unhealthy choices (sweets and fizzy drinks), they were more confused about classifying the foods that could have some healthy or unhealthy elements (such as a whole meal) (35). Children also identified the activities that occur in school, media, the taste of and peers as being influential over their food choice (35).

Using children as key informants to identify decision-making criteria around food has also been supported in Australia. In a similar study to Gosling et al. (35), Fitzgerald et al. (211), in 2009, explored what influenced physical activity participation and choosing healthy food options. Children clearly identified healthy options with fruit, vegetables and water (211). They suggested that fruit and vegetable breaks plus being able to access water in class were motivators (211). Barriers to healthy eating included taste, not enough time to eat and it is 'cool' to have junk food (211). Once again, the study concluded that children should be used more to inform adults why they make the food choices they do and made the point that we should listen to children given they are the heart of the school (211).

These key studies exemplify that children are able to communicate reasons behind their decision-making processes and they are mostly different to adult assumptions. Children also appear to use a range of criteria, with many similarities across locations and research approaches. More research that works with children directly to understand how they make food decisions is required.

2.7.3 Other perspectives

Social inclusion

Social inclusion is a concept to describe a sense of wanting to belong to a social group; this is particularly important to children in the school setting (179). The concept is described as peer inclusion, social acceptability and social modelling. Several studies presented in this literature review acknowledge the significance of social inclusion for school-aged children (26, 35, 46, 128, 150, 169, 170, 212). Peer modelling, where older or popular children have been shown to influence the decisions of peers, can influence the development of social norms (212). Peer modelling can positively influence the quantity and types of foods chosen by their peers (170, 212). In addition, children require the opportunity to practice (a healthy canteen) what they have learnt at school (healthy curriculum) to enable choosing healthy food to become a social norm (26).

2.8 Study significance

This literature review identified consensus amongst the international literature that childhood nutrition is imperative to maximise the health and wellbeing of children throughout their lifespan. Action is required to establish healthy eating habits early in life for all children. Factors that influence taste and food preference, hence food choice, include innate preferences and aversions, and repeated exposure. The evidence also reveals that a healthy food environment and choice are important aspects of developing a healthy eating habit. The school setting provides an opportunity to create a supportive environment so children can learn to make healthy food choices. Other factors shown to influence choice include taste, consistency of messages in the school environment, novel interventions (offering vegetables while waiting in the lunch line, non-food incentives, children ringing a bell if they chose the healthy plate), time to eat (more time allocated to eating lunch), linking classroom activities with the canteen, versatility (easy to eat) and social inclusion.

Evidence indicates that many canteens in Australia do offer several unhealthy options as well as healthy options and when unhealthy food is accessible and available, children will prefer to purchase this food. Given choice is important to create a habit, more research is required to understand what criteria children use to make food decisions. The findings of the literature review inform the major question for this thesis: Why do children make the food choices they do? Only a small number of studies have asked the children directly about their decision-making around food, this is promising but limited. This thesis begins to address this gap in knowledge. The objective of this participatory action research project was to ask primary school-aged children about their decision-making criteria for making food choice to understand what influences food choice from a child's perspective.

CHAPTER 3 METHODOLOGY

This chapter describes the philosophical viewpoint, theoretical underpinning, ethical considerations and the overall approach used in this research. A research paradigm brings with it a set of assumptions and beliefs. Each methodology has premises that are accepted as true when adopting that particular approach (213-215). Everyone brings their own suppositions and principles to their research, the importance of describing these helps to understand the stance taken by the researcher, which plays a crucial role in making sense of the research (215-217).

During the last 40 years, it has been recognised that 'good science' does not only equate to research that uses a positivist stance. Rather, rigour can be determined by considering and describing the philosophical stance by which researchers will approach their research (214, 215, 218) making it clear what lens will be used to view and interpret the phenomenon under investigation (214, 215, 217). This includes a clear justification of the paradigm that was adopted to guide the researcher and thus, the set of assumptions that will guide the research (213-215). The methodology described in this chapter is founded on the belief of many social researchers (47, 48, 213, 215, 219) that, given the complexity of human behaviours and variability of humans, flexible methods that can evolve throughout a study are warranted.

The following sections will describe the justification for adopting a research approach that incorporates a qualitative, inductive Participatory Action Research (PAR) method. The research comes from a public health perspective and considered The National Statement on Ethical Conduct in Human Research (NSECHR) when designing the method (55, 220)**.** The Ottawa Charter (discussed in section 1.3.2) was deemed the best fit to guide the planning of the research with a major focus on informing healthy public policy, strengthening community action and creating supportive environments (55). However, the Ottawa Charter was not embedded in the research as a framework to guide analysis.

3.1 The philosophical approach

3.1.1 Qualitative versus quantitative

Quantitative research inquiry is largely objective and aims to report all measures in a numerical form, searching for statistical significance (47, 215, 216, 218, 221). It originated from medical sciences and is based on a deductive logic, a logic that sees knowledge as being quantifiable (45, 47). One area of medical sciences is public health, which promotes health and disease prevention in populations outside of the acute care system. Epidemiology, the study of disease patterns in populations, is probably the most recognised quantitative investigation used in the medical sciences, including public health (47).

Qualitative research is based on studying people in their natural environment and most data (that is mostly spoken or written language) is converted to text for analysis (215, 218, 222). Research of this style delves into a creating deeper understanding about meanings, interpretation, norms and perception from the perspective of the study participants (47, 215, 217). Knowledge created can vary depending on how humans interpret their world, qualitative research seeks to capture participant views and interpretation of their environment (221, 222). The qualitative approach is now used regularly in social sciences and health, especially in the area of public health (47, 215, 218).

Both approaches can produce rigorous research (221, 222). However, quantitative research has been the principal type of methodology used in public health and is still seen as more rigorous than qualitative studies by many (218, 222). The idea that a quantitative inference is a superior approach is flawed when it comes to understanding human behaviour. Qualitative and quantitative approaches are two different ways of gathering information about the same issue and both approaches have valuable input into building knowledge. They are designed to gather different types of information (218, 222). The rigour and application of qualitative research in health-related fields is becoming better recognised (45, 47, 215, 218).

Quantitative research attempts to measure parameters in a controlled environment where as human life is far from being in a controlled environment (47, 218). The impact of social, environmental and political factors, variables that are often controlled for in quantitative research, are known worldwide to be factors that impact on health and disease states (47, 215). Public health research requires an approach that can be used amongst the public to understand what is happening in the complex environment people live in (45, 47). It is not realistic to control all of the complexities present in communities, nor is it realistic to make research amongst populations free from personal values. Qualitative paradigms also have an important role in formative research; exploratory and pilot work that can be used to develop an intervention that addresses actual need. The research project uses a mixed-method approach with a predominantly qualitative focus.

3.1.2 Deductive versus inductive logic

A deductive style of research is classically quantitative in nature; it begins with a theory which dictates what evidence is collected, moves to a testable hypothesis and then collects data to support or refute the theory (214, 221). As far back as the seventeenth century there has been debate surrounding traditional research methods that is based on deductive logic (214, 222). Francis Bacon was one of the first scientists to oppose the deductive approach (214). It has been reported that deductive reasoning assumes you can undergo research completely value-free, using controls for any variables, something which is difficult to achieve when you are studying human populations (214, 218). Deductive reasoning assumes knowledge is certain which might be the case in a laboratory situation where-by variables are all controlled for, however this is not the case in community environments. Building an understanding of how people view their world while they are in their everyday environment negates the essence of deduction that tests hypotheses in a controlled setting (217).

This research was undertaken using an inductive approach. An inductive approach aims to generate theory. This means the inquiry would commence in absence of a set theory and the data collected would inform the generation of a theory or new knowledge (as opposed to deductive approaches that test a theory) (217, 218). Given the complexity of studying humans and social life, ethical and practical considerations take priority over a quest to achieve data that is free from personal value bias (214, 215, 218, 223). Data collection that occurs within people's own familiar surroundings aligns well with an inductive approach.

Bowling, Hume and then Popper challenged the inductive inference (214). In fact, the tension between traditional quantitative research based on deductive inference and qualitative inductive approaches remains today (214, 222, 223). Despite the tension, inductive design continues to evolve and used widely for analysing qualitative data and development of theory in many social research fields (62, 214, 215, 223).

3.1.3 Epistemological stance

The theory of knowledge is a branch of philosophy referred to as epistemology (213, 217). It presents a set of criteria to define how researchers consider knowledge to be valid (213). Or put simply; what counts as knowledge (216). Disciplinary traditions have a whole set of assumptions about the best way to generate knowledge (217). Since research is essentially about producing new knowledge one must consider and define a viewpoint to justify how the research will discover new knowledge (213, 215, 217). That is, it is important to state the epistemological stance of the research. Epistemology is important for determining research paradigms. Three research paradigms - positivism, interpretivism and participatory approaches are discussed below.

Positivism

Scientific enquiry based on positivism is quantitative and deductive in nature (213, 217). It is based on a belief that a scientific method is about gaining knowledge to explain an objective reality and that knowledge comes from observation and measurement (45, 213, 218). Many researchers that embrace the positivist philosophy believe there is always a right answer, it comes from an objective viewpoint and because phenomena exist in a stable form, scientific enquiry should be free of personal values (213, 217, 218, 223).

Many qualitative theories of knowledge that directly challenge positivism were born from the positivism paradigm (217). Positivism is seen to view scientific enquiry as valid only when research is objective and value-free (48), this notion is challenged by action researchers who describe this stance as being flawed (47, 215, 221, 223). From the viewpoint of many social scientists, obtaining knowledge should be a process of sharing, reflecting and gaining perspectives from participants about their experience; compared to researchers who have their own agenda and limit the input participants have in the research process (217). Positivism is often seen as research done to people, rather than with people (217, 224). It has been suggested that while a methodological revolution occurred with the move from positivism to interpretivism, a blurring of disciplines remains (222).

Interpretivism

Interpretivism has emerged from positivism as a paradigm that allows a departure from the constraints of positivism (213, 222). Many social researchers view positivism as inappropriate and unachievable when undertaking inquiry with humans (213, 217, 222). This is based on the view that knowledge, and indeed reality, is constructed socially; influenced by culture and social interactions (222). It views the discovery of knowledge with a subjective lens, as opposed to the objective lens that is apparent in positivism (213, 215, 218).

Interpretive approaches are much more about interpretation of a phenomena in relation to culture or lived experiences (217). The researcher is entering a group, observing the behaviour and then interpreting those observations in order to understand human behaviour (213, 217). Interpretivism does not attempt to find the reality of the world but rather seeks to describe a subjective reality as described by a group of people (217). Interpretivism has a focus on interpreting the meaning that others have of the world or generating a theory or developing a pattern of meaning (216). It is typically qualitative and includes methods such as ethnography, phenomenology, grounded theory and narrative research (213, 216).

Participatory

A third epistemological paradigm that was born from interpretivism is a participatory approach (213, 216, 223). Given the participatory philosophy is more recent than the other two approaches, it is not widely used, although more social researchers are embracing the concept (216). The participatory approach, in clear contrast to positivism, believes that research should never be completely free of personal values (47, 215, 217, 223) and should be driven by the context of the study and participants involved with the collection of data (45, 47, 213). A participatory research approach becomes a cooperative initiative and key stakeholders in the community become co-investigators (45, 47, 217, 225).

A participatory style views an increase in knowledge to be about a process of sharing, reflection and embracing the community members as experts (225, 226). This is in stark contrast to a positivist approach where the process of gaining knowledge becomes about scientific experts extracting information or inserting an intervention (47, 217). Many researchers who work with a participatory approach aim to liberate communities and research has an emancipatory intent (227, 228). Freire began this style of liberationist philosophy during his revolutionary work that empowered the oppressed and addressed inequalities (227-229). His work evolved to link with education, as he believed education should be about empowering and liberating students (47, 217, 229). This in itself fits well with this research as it is about participation and about working with children. Others, such as Reason and Bradbury, place importance of empowering communities to increase an understanding of phenomena that is helpful for the group, as opposed to the researcher (226). In general, researchers who have worked, and still work, at a population level agree that a participatory approach is about conducting research *with* people, rather than *on* people (47, 217, 226, 229). Participatory research is the approach adopted for this research project.

3.1.4 Philosophical approaches in the context of working with children

A qualitative, inductive and participatory approach not only aligns with public health, it also aligns well with conducting research with children (213, 225, 230). A significant consideration, when working with children, is ethical conduct (217, 220, 230). The focus on ethical considerations (substantially covered 3.4 Ethical Considerations) has not always been given due importance (231). Children's participation in research about children has also been under-acknowledged in the past (231). Prior to the 1890's, research involving children was embedded in disciplines such as, sociology, psychology, anthropology, and education (230, 231). However, the involvement of children in research was primarily to discover new knowledge about evolution and development, rather than anything that would directly benefit children per se (231).

At the turn of the 20th century, a new paradigm was emerging, driven by social scientists, to research children, with an intent to improve the understanding of children, but the aim was still to benefit the researchers, not the children, (215, 218, 231). In the late 20th century, the study of developmental psychology in children was acquiring a collection of critics. Many research practices were reported as potentially harmful (231). Smith and Greene report that Piaget, Prout and James, and John Dewey are said to be early critics of the positivist stance taken for children's research (231). A paradigm emerged in early 2000, known as the 'new social studies of childhood' or 'Childhood Studies' (231), although it was not long before there was a recognition by researchers that knowledge ought to be used to assist people (222). The focus became about helping people by giving participants a voice throughout the research process, being people-centred and ethical (222, 225, 230). A participatory approach to research ensures that key stakeholders have a voice and that the research aims to benefit participants (217, 223, 225).

Incorporating the voices of children into research inquiry continued to evolve. Hill and colleagues (2006) were commissioned to investigate what research methods children were comfortable with when a childhood study was being conducted (230). The group used a participatory approach to understand viewpoints from children about what methods they preferred. While the study was not able to establish a clear consensus about their preferred ways to be included in research, some common attributes emerged. The key attributes included; fairness (children did not like being left out); working in a group with an activity to make it more fun; prefer a school setting; their time is precious; respect and effectiveness (that it will benefit them directly) and openness (230). In its own right, the Hill et al. study has demonstrated the importance of participatory methods amongst children by using participation to gather information (31, 230). There is acknowledgement that momentum is building towards the participation of children in research that aim to understand issues that directly relate to children (217, 230). Researchers agree that the literature is limited around matters relating to views from children about their behaviour (35, 100, 230). In relation to public health nutrition, research exists that questions children, or uses parents as a proxy, about what they eat. However, only a few studies ask the children directly why they make the food choices they do (35, 61, 69, 88). There is much support for using a participatory approach with students in the school context (35, 61, 225). The next section will discuss using a participatory approach in conjunction with Action Research.

3.2 History and background of adopted methodology – Participatory Action Research

Action Research refers to a research approach with several variations including Participatory Action Research (PAR). Many authors use the terms Action Research and PAR synonymously and depending on the source of the literature, it is referred to as both a methodology (an underpinning philosophy) and a method (how the research will be conducted) (213, 215, 219, 225). This section will describe Action Research in general and then look specifically at PAR.

There are essential components of Action Research that define this research approach, including; the use of action cycles (with each cycle containing a plan, act, observe and reflect element). The inquiry is based on a community identified issue, collaboration with key community stakeholders who become part of the research team; the researcher takes a facilitation role. It is an iterative process whereby the data collection methods are clear for the first action cycle but what data will be collected beyond the first action cycle will be unknown at the commencement of the study. This research commenced with an emancipatory intent at the beginning of action cycle one and then a focus on exploration occurred after reflecting on the results from the first action cycle. Part of the strength of Action Research is that the design includes a flexible approach to allow the results to drive the direction of the study as it progresses.

Baum (43), Smith (232), and Kemmit and McTaggart (225) document that the development of Action Research originates from social psychologist Kurt Lewin after World War II and was first published in 1946. Lewin applied the research to several community experiments amongst complex groups (227, 233). There were two key attributes held by groups that Lewin worked with; a commitment to change and an understanding where the group collectively agreed on the decisions (225, 227, 233). The history of Action Research is somewhat complex given that it did not appear to originate from one discipline (223). Brydon-Miller (223) attributes the development Action Research to people in a range of fields: John Dewey (philosophy and education), Sol Tax (action anthropology), Myles Horton (social justice), Paulo Freire (institutional and educational change). Kemmis and McTaggart (225) report that Stephen Corey, in 1949, recognised the value of linking activities that increased an understanding of an idea, with a plan to action change. Kemmis and McTaggart (225) also report that later, John Elliot and Clem Adelman applied the Action Research concept to the development of creating enquiry in the classroom, which is where Action Research began to evolve it's educative roots. The paradigm was developed further to suit educative applications (225, 232) and community and organisational change (224). Kemmis and McTaggart (225) provide a parsimonious description of action research as simply 'ideas-in-action' which captures the essence of this thesis. This thesis mainly refers to the work of Lewin (233), Kemmis and McTaggart (225), Brydon-Miller (223) and Dick (224) .

Real life is a mix of complexity, confusion and uncertainty (213, 219, 225). Advocates of Action Research acknowledge the methodology as being systematic, yet flexible, and thus provides the opportunity to conduct research in real life situations (219, 225). This enables groups of people in the context of their real life to participate in a process that either makes a change, provides a better understanding around a topic that relates to the group, or a blend of both (47, 219, 225). That is, the research is completed with community groups, not on a community, supporting a public health approach (47, 225). According to many AR advocates, there needs to be a combination of information from the people in addition to evidence-informed guidelines to change behaviour. Sustainable change needs to be driven by the community (62, 213, 226). Reason and Bradbury (226) discuss the importance of participation by stakeholders in the reflection and creation of solutions for improvement in practice to take place. "…action without reflection and understanding is blind, just as theory without action is meaningless".

A defining feature of Action Research is the action cycles, with each action cycle influencing the next in a pattern of plan, act, observe and reflect (224, 225, 232). Lewin's first representation of Action Research was described as a series of action cycles that connected in a spiral (225), shown in Figure 3.1 .

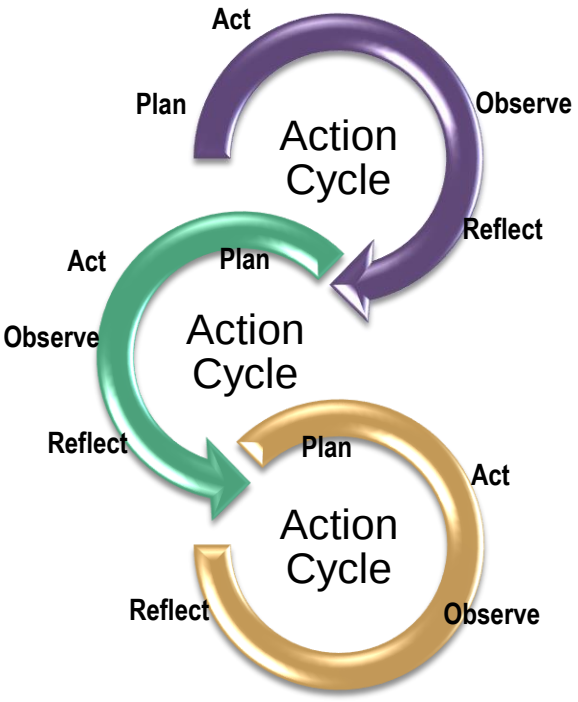


Figure 3.1 The Action Research spiral

In each cycle there are four stages; plan, act, observe and reflect. In short; 'plan' represents a group of participants and a researcher planning an action based on a general idea; 'act' it to implement the plan; 'observe' is to observe the process and for the group to observe the results; 'reflect' is to consider the results and decide what to do in the next cycle (47, 213, 224, 225). This continues for as many cycles as are warranted (225). The iterative process of Action Research develops clarity, and, unlike conventional research methods, the research questions, methods used and direction of the study evolves with each iteration (224). In most forms of Action Research the original literature review evolves significantly as the research progresses through the action cycles (219).

Action Research allows research that begins with a general idea, to conclude with effective research outcomes. To explain this further, the research has a clear plan of inquiry for action cycle one and a comprehensive strategy to proceed with the PAR process, however, the direction and research questions could evolve after each cycle; what one expects as the start might change (213, 224). This can be challenging for those who use conventional research methods (224). To engage in Action Research, advocates suggest one must be willing to be wrong and trust that participants, who are the target audience in the research, will know detail about their own lives and interests better than anyone – researchers must value the knowledge of the participants (223, 228). Action Research transforms "social realities" (228).

With all of the elements of Action Research, PAR is an established qualitative research tool and is about enabling local participation in the creation of solutions to improve practice (62, 213, 226). Although PAR is typically qualitative, it can be quantitative or a mix of both (62). The important factor, as the name infers, is that true PAR "involves participants in a process of collective, self-reflective inquiry in order to understand and improve situations by facilitating change" (226). It has also been suggested that the participation in PAR is more about an emancipatory approach compared with other forms of Action Research; that is empowering and 'freeing' the people to decide on their own change of practice (62, 226).

The research described in this thesis began with an emancipatory intent using PAR. As the project progressed, it became more about using participatory research (as an underpinning philosophy) with Action Research to encapsulate children's decision-making criteria/motivation around choosing food. While the project set out to make a change within the school's food environment, it developed into understanding children's motives behind food choice.

Key concepts of PAR include empowerment and equality (62, 226). These are also central concepts for health promotion in a public health context (58). PAR is powerful because the community (for example students, a school, suburb or workplace) is coming up with the solutions and are driving the direction of the research (217); this is classic empowerment. The researcher is facilitating the process and everyone takes some responsibility (62, 217). The outcome is largely for the community to increase the level of control they have over the improvements they want to see and continue to improve their capacity to do so (62). PAR is an "active and cyclic process"(223). It is best to start the cycles small and increase as the project builds in momentum and participants become more confident (234). Learning comes from acting, observing and reflecting (223). As seen earlier in Figure 3.1, action cycles can be portrayed as a spiral (225). As PAR has evolved, it is more common to see the cycles in a linear fashion as articulated in Figure 3.2, where one cycle follows another.

Each cycle contains the elements of; plan, act, observe and reflect, as conveyed in Figure 3.2. Upon reflection of one action cycle, planning commences for the next cycle.

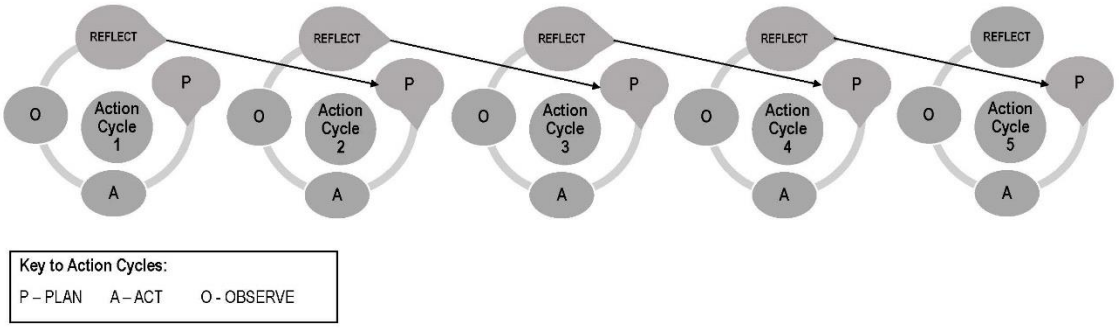


Figure 3.2 This figure shows the flow of action cycles.

Plan

In Action Research, the project team's first task is to plan the initial action cycle (213, 224, 225). The aim of the planning phase is to establish what data is collected, how to collect it and who will collect the data (213, 224, 225). Note that this planning stage is for a single action cycle, without knowing what data will be collected for the next cycle (225). In the case of this project, the general theme was initially about improving healthy eating amongst children and that led to the planning of Action Cycle 1.

Act

During the 'act' element, the team implemented the planned data collection, which is not necessarily the researcher (213, 219, 225). Once this process is complete, the data is given to the researcher to analyse (213, 225). This phase is deliberate and systematic (213) and this part of the action cycle is the platform for generating ideas for the next cycle (213, 224, 225). The group must be prepared to compromise and make spontaneous adjustments (225).

Observe

When all of the data analysis is complete, the results are delivered back to the group, where they observe and discuss the results (213, 224, 225). The results of observation then inform the next phase of the project. The group could observe unforeseen gaps in the data or new ideas could arise (225).

Reflect

At this stage, reflection gives rise to the beginning of the next cycle as the project team meet to reflect on the processes, results and limitations of the results just gathered (225). This is the point where a decision is made about data to collect for the next cycle, how to collect it and who will collect the data (213, 219, 224, 225). The group then move on to a new planning stage and a new action cycle. The iterative process continues through cycles until the team decide that enough data was gathered.

Participatory Action Research summary

A team typically conducting this type of research includes a professional researcher and a group who want to improve something in their community or organisation (47, 62, 215). The group or project team define the problem, explore a solution and take action. Then team discuss and reflect on the results and from the findings, the cycle starts again. PAR promotes inclusiveness and participation in the research process, by being closely involved, stakeholders can gain more satisfaction from the research process (62). Team members are just as involved with the development of solutions as the researcher is. The cycles build the confidence and capacity of participants to understand an issue and look for solutions to improve practice.

There is recognition that the research questions and strategies stated at the onset of the project are not going to necessarily be the same at the end (225). This is an accepted attribute of the paradigm and fits with the fluid and dynamic nature of Action Research (219, 223, 225). The dynamic nature of Action Research is a positive attribute for working in the context of social health, which is also recognised as a limitation. Other limitations include less definitive data and a limited capacity to generalise results on completion of the research (235).

The process is not always as neat and defined as portrayed in Figure 3.1 and Figure 3.2. Instead the cycles tend to be fluid and flexible (219, 225). Unlike conventional methods, there is room for the research strategies to evolve and change depending on the outcomes of each cycle (223). Although PAR is a good fit for public health, because it engages and collaborates with a group of people and advocates for positive change, it is not used as often in health promotion interventions (213).

A shared ownership of the direction a research project takes, and the participation from the target group, sets PAR apart from conventional research methodology (223). For example, in the study undertaken as part of this thesis; the staff were integral to the direction the PAR took and how the data was collected; the children were the primary target; and they participated in the data collection by providing the information unfiltered. The researcher facilitated the process and was responsible for the analysis of the data and reporting the findings to the project team (school principal, three teachers, a parent and the researcher).

3.2.1 The PAR approach in context to working with children

A PAR approach increases the capacity of communities to solve their own problems. Interventions developed through PAR are thought to be more applicable to people within their own environment, compared to a conventional investigator-driven methodology, which often occur with a rigid methodology (235). PAR has been reported as an appropriate research approach when working with children and schools because Action Research can act as a flexible process to make improvements within the school environment as well as understanding what is happening amongst ‘participants’ (217, 225, 235).

The National Statement on Ethical Conduct in Human Research (NSECHR) has strict guidelines about how you can ethically involve children directly in research (220). PAR principles align with the values in the NSECHR, which are described in more detail below (section 3.4). In particular, a project working directly with children will not go ahead if there is a risk of harm to the children. In investigator driven research, the chief investigator is an 'outsider'. While the researcher might be academically senior, they are much less knowledgeable about the community. In the case of the research described in this thesis, the teachers were the experts about conferring with their students, knowing the students on an individual basis, having a relationship with trust and understanding the school community culture. By adopting the PAR approach, the methodology aligns with ethical requirements for collecting data directly from children.

3.3 Ethical considerations

In accordance to NSECHR (under *Children and Young People, section 4.2*), there are a number of research values to be adhered to when working with children in Australia (220). The values include; research merit and integrity, justice, beneficence and respect. In addition it is expected that research groups consider the following principles; standing parental consent and the best interests of the child (220). The design of this research integrated the research values described in the NSECHR.

This study has received a full ethics approval through the University of Tasmania, Social Science Human Research Ethics committee (HREC), number H0012935. An information and consent sheet for participation was provided to the school who distributed to the relevant parents. Only children whose parents signed a consent form participated.

3.4 Summary

The section has described the overall methodology of this research, including theoretical underpinnings, research approach, and ethical considerations. In research, depending on the methodology adopted, there can be different views on the same subject matter. That is to say, it depends on the window the researchers look through as to how the study will be viewed and interpreted. It is imperative to articulate the methodology adopted clearly to justify the research approach and provide clarity to the methods of data collection and interpretations used to conduct this research.

The research considers a public health perspective, based on attributes of the Ottawa Charter for health promotion, as part of the overall research planning. The philosophical approach was guided by the underlining principles of qualitative, inductive and participatory inference. This study recognises that input about children's motivations coming directly from children is an important part of decision-making, which has been overlooked in many decades of research. The following chapter will describe detailed specifics about the research approach.

CHAPTER 4 METHODS OF DATA COLLECTION AND ANALYSIS

In this research, the children (students) were key participants in the generation of knowledge about their food choice. The staff and parents involved in the study provided input into planning, implementing, observing and reflecting on the findings of each cycle. The researcher facilitated the process, provided technical input, analysed the data and compiled the report. All project team members (the researcher, principal, three teachers and a parent) were just as involved with the development of solutions and the flow of action cycles as the researcher was. Collaboration and participation were present across the action cycles, which follows a classic Participatory Action Research (PAR) process (more detail can be found in Appendix 11).

PAR starts with a general question and the first action cycle is planned using this idea. The project school was committed to improving healthy eating among their students during school time. They preferred to start by improving the canteen environment. After preliminary discussions with the researcher, principal, three teachers and a parent, it was agreed that the children had not been asked directly about their motivations around food choice and they should be key informants. The group was formalised as the project team and were willing to participate in this. It was proposed that children's views could inform the creation of a healthy food environment within the school setting and positively influence children's food choices.

Each PAR cycle builds the confidence and capacity of the participants to understand an issue and look for solutions to improve practice (62, 226, 236). The design and concept behind each cycle came from the project team while the researcher facilitated how the data could be collected and managed the analysis of the data. This chapter outlines key concepts used, the research questions, the research approach, data collection and the data analysis plan.

4.1 The Project school

4.1.1 Characteristics of the project school

The project school was a Tasmanian, Catholic non-government primary school, in Southern Tasmania, with approximately 450 enrolled students ranging in grades from kindergarten to grade six. The socio-economic index for areas (SEIFA) ranks geographical areas in Australia according to relative socio-economic advantage and disadvantage (237). Measures of disadvantage include; low education levels, unskilled occupation, low income and high unemployment. The suburb of the project school has a SEIFA ranking of two for disadvantage (one being the highest level of disadvantage and 10 being the lowest level of disadvantage) (237). Given that health status is positively associated with education and income (14), the index provides context to the school under investigation. The school is in an area with low education levels and high unemployment; such demographics typically have lower levels of health attainment (14, 43). The total number of students enrolled for 2012 and 2013 was 372 and 463, respectively.

The school did not have an existing nutrition policy at the commencement of the project, nor was it engaged with any state nutrition related health promotion initiatives targeted at primary schools (such as, Move Well Eat Well - MWEW and Cool Canteen Accreditation Program - CAP). There was a canteen operated by a canteen manager employed by the school. After data collection, the school engaged with the MWEW programs and Cool CAP.

4.1.2 Participants' profile

Participants were children from four classes representing grades two to six with approximately 25 children in each class. The school principal and teachers on the project team coordinated the recruitment of students to suit their weekly teaching activities. The age range of the study group was 7-12 years old. The study cohort was a convenience sample and chosen to obtain views from children across a variety of ages within primary school. The primary target group in this project were the children.

To achieve insight into the decision-making process of children, an innovative and non-invasive approach that captured first person information was sought. It was important to collect data within the child's normal and familiar school environment, which aligns with the research approach used. The data collected throughout the study came directly from students, collected by their teachers within the school environment.

4.2 Key concepts

The dietetics community in Australia refer to food with poor nutrient content as unhealthy, 'sometimes', 'red' or 'discretionary' foods (16, 37, 81, 97). Poor nutrient content refers to unhealthy foods, foods high in energy, foods with poor nutritional value, refined and processed foods, food and drinks high in refined sugar and/or fat and/or salt (97). Nutrient dense foods are referred to as healthy, 'everyday' or 'green' foods (16, 37, 97). The National Healthy School Canteen guidelines include a specific document that classifies food sold in the canteen (Guidelines for Healthy Food and Drinks Supplied in School Canteens) (203). The food classification is based on a traffic light system. With 'green' foods at one end of a spectrum and 'red' foods at the other, there are a group of foods that fall somewhere in the middle called 'amber' foods, which contain elements of both 'green' and 'red' qualities (97). These guidelines use 'red', 'amber' and 'green' to classify the quality of food. The author put together a visual representation of the classification system to convey that food quality lies on a spectrum (Figure 4.1).

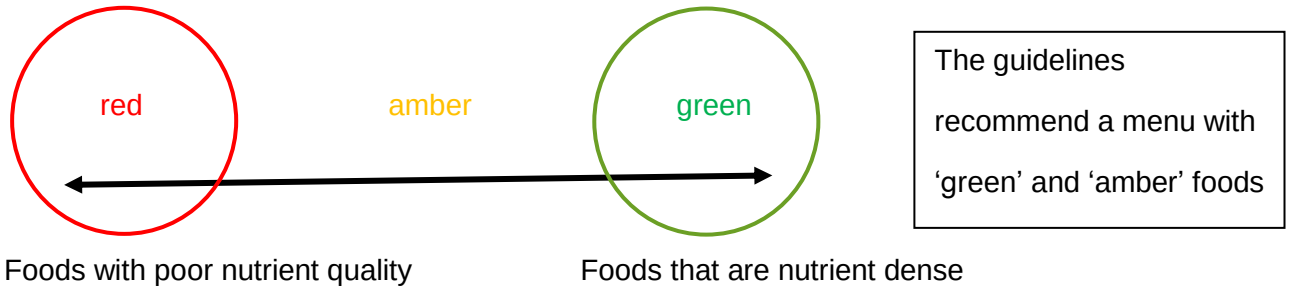


Figure 4.1 A visual representation of how food is classified in the canteen

In this study, foods were classified according to the Tasmanian School Canteen Association (TSCA) Product List (202), which was based on the Guidelines for Healthy Food and Drinks Supplied in School Canteens (203). Foods will be referred to, as 'green' or healthy choices, 'amber' and 'red' or unhealthy choices (Figure 4.1). The one exception relates to the classification of pies, sausage rolls and chicken nuggets. The TSCA product list includes products that have been modified (through a serve size reduction, recipe modification or a combination of both) to fit the 'amber' criteria. Pies, sausage rolls and chicken nuggets are generally unhealthy, and defined as a 'discretionary' choice and therefore, these foods were classified as 'red' for this study.

4.3 Initial research questions

The overall vision of the study, originally, was to create a school food environment that included engaged students, parents and staff who were committed to offering and consuming healthy food, and where a healthy food environment was seen as the norm in the school community. The project team agreed that the following questions needed exploring in the first action cycle:

- What proportion of students are using the canteen?
- What food would students prefer to see in the school canteen and why?
- What 'green' foods do children prefer?
- Do children have an understanding about what healthy food is?
- What healthy foods would children buy from the canteen?
- Can children describe why they choose unhealthy foods?

These questions shaped the planning of the first action cycle. Subsequent action cycles were not planned ahead of time as the reflection of an action cycle informs the planning for the next action cycle – this process continues until data sufficiency is reached. Thus, the number of action cycles completed is not pre-empted before the commencement of the research, action cycle one being the only cycle that is thoroughly planned.

4.4 The research approach has evolving action cycles

The convenience sample used in this study included students enrolled in a catholic non-government primary school in Southern Tasmania. Children in grades two to six participated (except in action cycle two, which included students from Kindergarten to grade six who bought from the canteen that day), representing children aged 7-12 years old.

The project had intentions to understand children's food choices from their perspective, change the food environment within the school in accordance with children's motivations and see if this changed their eating behaviour. The progression of the action was expected to be linear as shown in Figure 4.2.

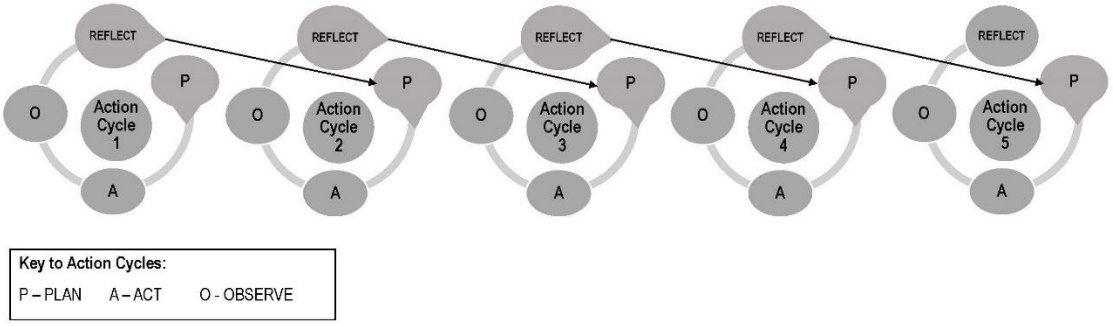


Figure 4.2 The five action cycles completed in this study were anticipated to be linear.

Due to the nature of PAR, the approach evolved with each cycle and the led to action cycles that were a matrix of interconnected cycles (Figure 4.3). At the onset of the project, it was unknown how many cycles would make up the research journey. The outcome was five action cycles as described below (Figure 4.3). The details of each action cycle are described in the following sections.

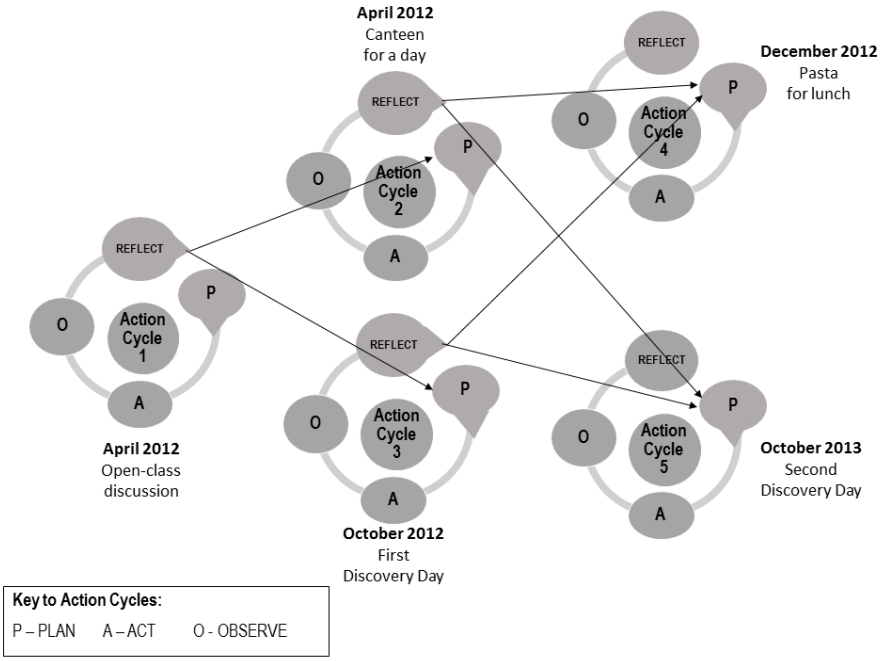


Figure 4.3 The completed action cycles and how they inter-related

4.5 The Action Cycles in detail

Data was collected using five different action cycles. Each action cycle is described individually below, and there will be a visual representation to clearly convey how each cycle evolved. It is important to note that the data collected, analysed and reflected on from one action cycle led to the planning of the next cycle.

4.5.1 Action Cycle 1 – Open-class discussion

At the commencement of the research, Action Cycle 1 was planned to capture data to answer the questions listed below. Figure 4.4 shows the first cycle, emphasising that at this stage, the researchers did not know what the next cycle would be. During the 'plan' phase of Action Cycle 1 (refer to 'P' on Figure 4.4), the research team agreed on a range of research questions that are listed in section 4.3 (page 99).

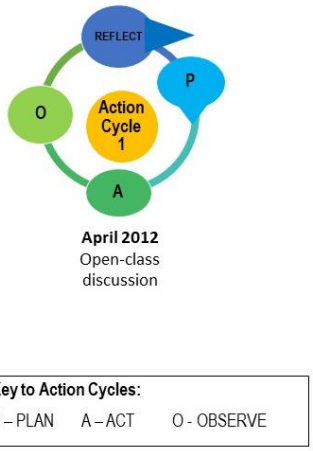


Figure 4.4 At the commencement of the project, Action Cycle 1 was the only cycle planned

During the 'act' phase of Action Cycle 1 (refer to 'A' on Figure 4.4), the first round of data collection was completed. These data were obtained by two teachers through open questioning to two groups of children using purpose designed semi-structured questions provided by the researcher. The children were students from grades three to six. The teachers were each provided with the same template to record the answers. On completion the results were emailed to the researcher who prepared a summary of results to observe and discuss (refer to 'O' on Figure 4.4). The teachers asking the questions were members of the project team and children answered with a show of hands or verbally contributed to the questions asked. Children were able to provide more than one answer.

Table 4.1 Questions asked of two groups of children in the classroom

Question No.	Question that the teacher asked the class as a group	Extra detail given to the teacher
1	How many of you bought food from the canteen last week?	Ask for a show of hands and count number of children that bought food from canteen last week.
2	What is your favourite food in the canteen? *	List the food that student report, if there is a repeat of the same food take a note as shown in table (or write on whiteboard and take a photo)
3	What food items would you like to be available in the canteen? *	Record as above
4	What do you think a healthy food is? *	Record quotes or tape the discussion
5	Visioning exercise: Ask the class to imagine if their school canteen just won an award for having the best food anywhere in Australia. Then ask them to describe one at a time WHY they would have won it? What was about their best canteen ever that would be good enough to win such an award for having the best food possible? *	Have the class sitting down. Record quotes or tape the discussion
6	Reflect back to the children the unhealthy food choices if they were included in the answers from previous question (for example 'Red Foods' – lollies, confectionary, soft drink, highly processed foods, fried food, pastries etc.) and ask what is it about these foods that they like (prompts – taste, sugar hit, hot, has sauce, cool, all the children eat it, familiar) *	Record quotes or tape the discussion
7	What healthy foods do you buy from the canteen menu now?*	Record ideas or tape the discussion or write on whiteboard and photograph

*Children could vote or contribute more than once for all questions except question 1.

Finally, the project team met to observe and reflect on the results (refer to 'O' and 'reflect' on Figure 4.4) in preparation to plan for the next cycle.

4.5.2 Action Cycle 2 – Canteen for a day

Upon reflection of the results that came from Action Cycle 1, it was agreed that an action cycle was required to determine what foods were offered to children from the canteen and what food were children actually choosing from the canteen. Thus, as shown in Figure 4.5, Action Cycle 1. the reflections from Action Cycle 1 informed the direction and scope of Action Cycle 2, which equates to the 'plan' phase of Action Cycle 2 (Refer to 'P', Action Cycle 2 in Figure 4.5). The parent from the project team spent a full day in the school canteen to collect data, which was recorded and emailed to the researcher for collation and analysis (refer to 'A', Action Cycle 2 in Figure 4.5).

The information collected included; what food options were offered for lunch orders; what food options were available to buy over the counter during recess and lunch; how were menu items being prepared; what did children buy from the canteen on that day.

In preparation for the 'observe' phase in Action Cycle 2 (refer to 'O', Action Cycle 2 in Figure 4.5), the foods offered (and purchased) were categorised into 'green', 'amber' and 'red' according to the Tasmanian School Canteen Association Product List (202), which was based on the Guidelines for Healthy Food and Drinks Supplied in School Canteens (203).

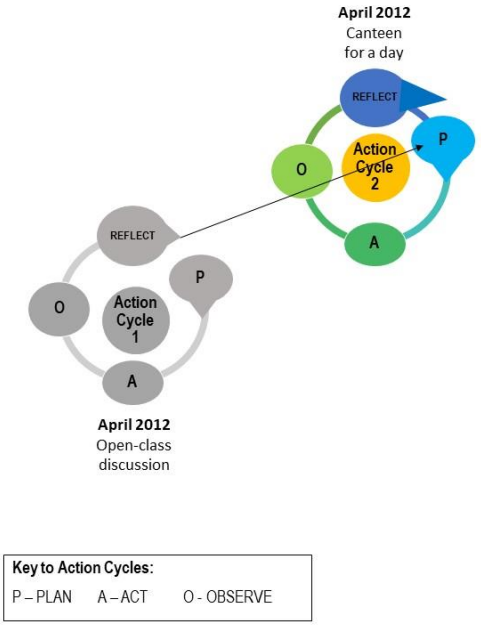


Figure 4.5 The connection between Action Cycle 1 and 2

A summary of the results was prepared by the research and the project team met to 'observe' and 'reflect' on the results (refer to 'O' and 'REFLECT', Action Cycle 2 in Figure 4.5).

4.5.3 Action Cycle 3 – First Discovery Day

The reflection of results from Action Cycle 1 led to two discrete cycles, Action Cycle 2 and 3. The 'plan' for Action Cycle 3 (refer to 'P', Action Cycle 3 in Figure 4.6) was to focus on further investigation of the reasons why children chose the food they did. It was at this point that the research questions were clearly defined; Are children able to provide information about why they make food choice decisions; Are children able to articulate what influences their food choice?

In the third action cycle, the plan was to collect data through a Discovery Day. This data collection represented the 'act' phase in Action Cycle 3 (refer to 'A', Action Cycle 3 in Figure 4.6). The organisation of Action Cycle 3 was largely facilitated by the teachers on the project team. They were familiar with the Discovery Day process and with the children. The teachers had previously used the Discovery Day to assess units of enquiry in the curriculum. Edward De Bono's six thinking hats guided students how to separate their thinking about the task to help them work out how to complete the task autonomously, without assistance from the teachers. Each hat has a different colour and represents a different way of thinking. During the Discovery Day, children worked in groups to develop a healthy canteen menu and described why they put their chosen food on the menu.

The Discovery Day took place in a large open learning area. Children from grades two - six (n=100) worked autonomously in groups for a school day and came up with the menus on their own. The children had full access to classroom materials, whiteboards, internet and computers. They were able to set themselves up where they wanted. The timeframe was from approximately 10 am until just after lunch (with recess and lunch breaks as usual). The children were responsible for managing their time to get the task completed prior to presentations, which were held after lunch. Students had to share the presentation of their menu and the description of why they chose the foods listed. They could choose how they created the menu and how they presented the menu and reasons why they chose the food on the menu.

A project team member filmed comments made during the day and the presentations given at the end of the day. In line with PAR used in this thesis, asking children about their reasons they chose the food for the menu provided an opportunity for students to reflect on their answers during the cycle. These video clips were viewed twice at the school by the researcher before the audio was transcribed verbatim and a content analysis completed. A summary was prepared for discussion with the project team as part of the 'observe' and 'act' phase of Action Cycle (refer to 'O' and 'REFLECT', Figure 4.6).

The teachers on the project team orchestrated the concept and design of the Discovery Day. This activity provided the school with a learning opportunity linked to De Bono's six thinking hats (238, 239). The colourful thinking hats are used to guide decision making by simplifying thinking, with each colour representing a different way of thinking (239). They are known to be fun to teach and easy to learn. The project school already used the thinking hats during previous class activities and in a Discovery Day unrelated to this study. The hats enable young learners to focus on separate thinking skills, and then combine them to gain a complete perspective. Children associate the different colours of the hats with key words that sequence their thinking (238).

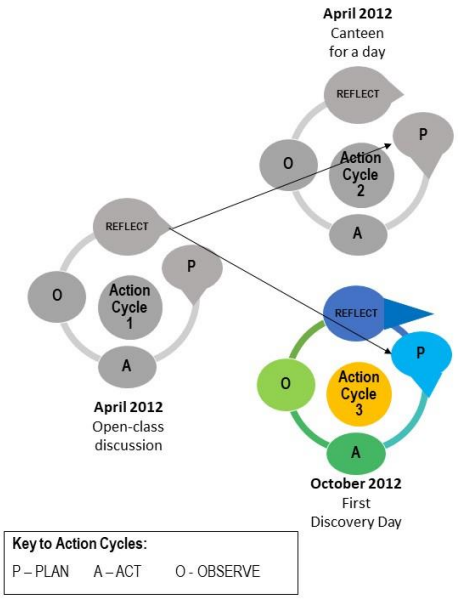


Figure 4.6 Action Cycle 1 informed independent inquiries in Action Cycles 2 and 3

Figure 4.6 shows the relationship between Action Cycle 1, 2 and 3, and it can be seen that data from Action Cycle 1 led to the planning of two independent cycles; Action Cycle 2 and 3.

4.5.4 Action Cycle 4 - Pasta for lunch

On completion and reflection of Action Cycle 2 and 3, it was agreed a fourth cycle was required and this led to the 'plan' phase of Action Cycle 4 (refer to 'P', Action Cycle 4 in Figure 4.7). Action Cycle 4 was planned to test the impact on children's choice when a healthy menu item was developed that incorporated children's food choice criteria (which emerged from Action Cycle 3).

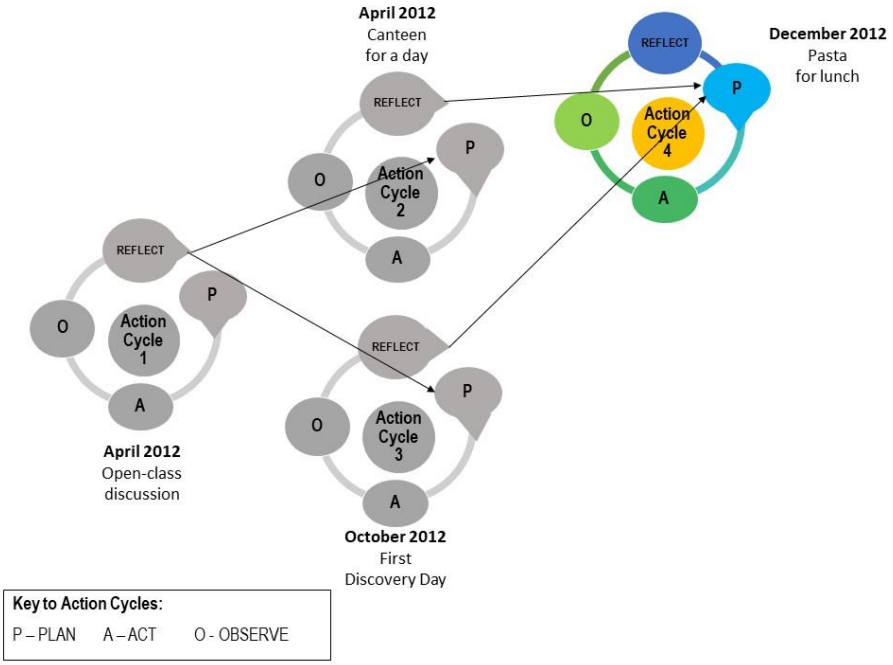


Figure 4.7 Action Cycle 2 and 3 informed the planning for Action Cycle 4

The project team decided to investigate this idea in a small pilot study. The researcher provided guidelines to the school about suitable ingredients and cooking methods that would a create spaghetti bolognaise meal, which was classified as a 'green' option according to the Guidelines for Healthy Food and Drink Supplied in School Canteens (240). The meal was only available as a lunch order and not over the counter during recess or lunch.

As part of the 'act' phase, a small number of parents volunteered to prepare the meal, with a project team member. The meal was prepared onsite (refer to 'A', Action Cycle 4 in Figure 4.7). The number of meals ordered and observations of wastage were sent to the researcher to compile a summary for the 'observe' and 'reflect' phase of Action Cycle 4 (refer to 'O' and REFLECT', Action Cycle 4 in Figure 4.7). The interconnection that is beginning to form between action cycles is showing in Figure 4.7. Action Cycle 1 led to Action Cycle 2 and 3, which both informed Action Cycle 4.

4.5.5 Action Cycle 5 – Second Discovery Day

The reflection of results from Action Cycle 2 and 3 led to Action Cycle 5. The project team agreed data sufficiency was not reached after Action Cycle 2 and 3, which led to the 'plan' phase of Action Cycle 5 (refer to 'P', Action Cycle 5 in Figure 4.8). Action Cycle 5 was a repeat of the Discovery Day in Action Cycle 3, with the intention was to increase the focus on 'why' children made the choices rather than what they chose. This action cycle directly related to the key research questions; Are children able to provide decision-making criteria for their food choice and articulate what influences their food choice?

Upon reflection of Action Cycle 3, much discussion ensued with the project team. When the researcher suggested that more data was required to reinforce information collected already (because data sufficiency was not reached), the team provided reasons why children make food choices, which were different to what had been discovered. The team realised that unconsciously, they started making assumptions. At this point, the whole team agreed to collect more data through a repeat of the Discovery Day.

Six key changes were made to the second Discovery Day. First, the scope of the exercise was limited to choosing five menu items and three drinks. Second, the groups were asked to create a canteen menu without emphasis on it being healthy. Third, more explanation was provided about how to report 'why' menu items were chosen. The fourth change was a worksheet with a simple pictorial of the thinking hats with directions about the day was used. In addition, the worksheets were collected and used in the analysis. Finally, the researcher was present on the day to film the groups.

As part of the ‘act' phase, grade two to six participated in Action Cycle 5 (refer to ‘A’, Action Cycle 5 in Figure 4.8). The timing was from approximately 10am until just after lunch (with recess and lunch breaks). Each group presented their menu, worksheet and description about their chosen menu items to their peers and teachers. The worksheets were handed in at the end of the day to the researcher for analysis. The researcher was present and filmed the progress of each group, while asking the groups about their motivations around menu choice. The videos were viewed by the researcher before the audio was transcribed verbatim, the worksheets were to be viewed alongside to the videos and a content analysis completed. A summary of results was prepared for the ‘observe’ and ‘reflect’ phase (refer to ‘O’ and ‘REFLECT’, Action Cycle 5 in Figure 4.8). The project team agreed that data sufficiency was reached at that point (see Appendix 11 for more detail) and no further action cycles were planned. Figure 4.8 shows that upon reflection of both Action Cycle 2 and 3, Action Cycle 5 was planned.

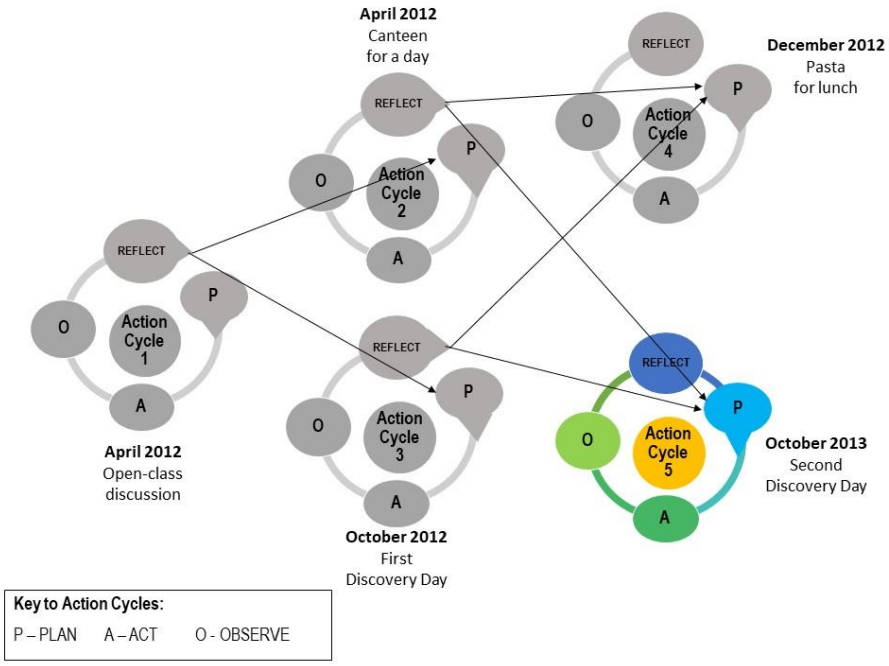


Figure 4.8 Results and reflection from Action Cycle 2 and 3 led to Action Cycle 5

4.6 Data collection, management and analysis

Conventional content analysis was used to interpret the qualitative data collected from Action Cycle 3 and 5. Other qualitative data from open-ended questions in Action Cycle 1 were transferred to Microsoft Excel. Some numerical data was collected during Action Cycles 1, 2 and 4, which were transferred to Microsoft Excel and summarised as basic descriptive statistics (total number, averages, and percentages). This section will discuss the methods used to collect, manage and analyse the data in more detail.

4.6.1 Discovery Days

Data collection and management

On each Discovery Day, a member of the project team filmed groups during the day; the parent filmed the first Discovery Day and the researcher filmed the second Discovery Day. Worksheets were completed by all of the groups and collected at the end of the day.

The researcher observed all the video content, for each Discovery Day, twice. During the second round of video observations, video clips were viewed and excluded based on; clips that lasted less than 10 seconds, clips containing irrelevant footage (such as accidently videoing, a discussion on a topic that had nothing to do with the Discovery Day, discussions that were discussing the planning of the task rather than the outcomes of the task). Forty-eight out of 78 clips (Discovery Day one) and 24 out of 27 clips (Discovery Day two) were sent to be transcribed verbatim.

Data analysis

Content Analysis (CA) is a flexible method for interpreting qualitative data (241, 242). This systematic process condenses large amounts of raw text data and translates it into categories then themes (241, 242). Reducing the data to categories then themes allows the researcher to establish a clearer picture about what the data is representing. The CA process allows researchers to obtain a greater understanding of social realties in a subjective but systematic and scientific way (242). Like all research paradigms, CA has evolved over time. There are now three variations of CA used to analyse qualitative data: Summative, Directed and Conventional CA (241, 242). Given the varying definitions of CA, it is necessary to describe the process in each research case.

Summative CA analysis begins with counting common words or content (242). Further exploration of the words occurs to understand their usage in context of the research (241, 242). Summative CA aims to understand the contextual use of words. Directed CA begins with an existing theory or research and initial coding of the categories is based on key concepts or variables from the theory in question (241, 242). The researcher then analyses the data using predetermined codes and new categories may emerge (242). Directed CA aims to validate, refute or extend a theory (241).

Conventional CA is used in the absence of an existing theory about a phenomenon and generates new knowledge to develop concepts, ideas, behaviour models or theories (241, 242). The data directly informs the coding process, categories then emerge from the data through inductive reasoning during the analysis (242). The researcher then creates themes from the categories to understand a phenomenon (241); in the case of this research, children's eating behaviours (241). As there are limitations in the literature about the phenomenon surrounding children's eating behaviour, this research did not set out to test an existing theory but rather to generate new knowledge. Therefore, conventional CA was used to analyse data from Action Cycle 3 and 5.

The benefits of Conventional CA is that data collection is from direct participation and without pre-empted theories or categories, which can reduce bias (241). This of course can also be a disadvantage, there is a risk that categories are missed or the link between data and the findings is compromised (241). To strengthen data analysis the researcher incorporated processes known to establish trustworthiness in qualitative research; credibility, transferability, dependability and confirmability (241-243) .

The basis of credibility is twofold; use an appropriate transparent process to collect and analyse data that will provide an accurate representation of the study participant's perspectives; and clearly describe the processes used to analyse the data (242). Techniques used to improve credibility included collecting data over multiple time points, accessing data directly from children in their own environment, using a peer debriefing process during the research (through supervisors, conferences and journal publications), using concepts that emerged from multiple respondents and refining the research as more information became available following each action cycle (241, 242).

Another technique to strengthen credibility was gaining knowledge from different sources at different points in time across five different action cycles, comparing the data to ensure the findings concur across the data and synthesising the information at the end of analysis (243).

Transferability is the extent that the research can be transferred to another context (243). It is the researcher's role to provide quality data and descriptions, which allow other researchers to make judgement about the application of the research to various contexts (243). The researcher presented the data by documenting the research in a thesis, presenting to local stakeholders, at national conferences and publishing in two international journals. The feedback thus far about the model that was developed from the research is that, the results are clear and potential application of the model into the school setting is easy to understand.

Dependability and confirmability reflect the links between research processes, data collection and interpretation of findings (242, 243). Dependability was strengthened by using a transparent process that was reviewed regularly by supervisors and using inter-coder verification (supervisors KS and LM) to analyse the data (242). Confirmability was strengthened by sharing the research with a range of academics and practitioners in a variety of ways (department meetings, workshops, conferences, journal article submissions), then applying any feedback to research documentation to improve the articulation of the research.

In line with conventional CA as described by Hseih and Shannon (241), and support by Zhang and Wildemuth (242), data was analysed to develop codes and categories (Table 4.2). There were two slight deviations from Hsieh and Shannon's approach to Conventional CA (241), clusters are referred to as themes in this research and themes were then used to conceptualise the data into theoretical concepts. Over several iterations the coding schema, general categories and then themes emerged. Unlike other versions of CA, the coding schema was not established before the data analysis began. The detailed process used (presented in Table 4.2) was based on Hsieh and Shannon's work (241):

Video clips were watched and notes taken to allow the researcher to immerse herself into the data and get a sense of the whole.

During the second viewing of the video clips, key words that described reasons why children chose food and other repeated codes were highlighted. During this iteration, the coding units and categories began to emerge.

Steps 1 and 2 were completed for Action Cycle 3 before Action Cycle 5 commenced. From this point in the process, a more detailed analysis was performed on each action cycle individually but with a much shorter period between analysing each cycle.

Video clips that were more than 10 seconds long and relevant to the research were transcribed verbatim for each action cycle.

The researcher fully engaged with the transcripts by reading them word for word, highlighting quotes that captured the thoughts of children and repeated words and phrases, which let codes emerge.

After the transcripts were read again, with further annotation and checking of codes, supervisors viewed and verified the codes.

Codes were developed with each iteration, which allowed categories to emerge, which was also discussed with supervisors.

This same process was completed independently for each Discovery Day. On the second Discovery Day there were worksheets collected. These were used to support the analysis of video clips and transcription data that came from Discovery Day two.

Once sufficient consistency existed for each independent Discovery Day, the themes from the two different data collection days were synthesised together to create theoretical concepts and then a model to convey children's decision-making criteria for food choice (Figure 4.9 Conventional Content Analysis plan for Action Cycle 3 and 5).

	Codes	Categories	Themes	Theoretical concepts
Action Cycle 3 - Discovery Day one	Repeated quotes, phrases and words to describe why foods were chosen	Groups of codes that represent the same idea	Groups of categories that represent the same concept	Consider clusters or themes from Action Cycle 3 and 5 collectively to develop theoretical concepts
Action Cycle 5 - Discovery Day two	Repeated quotes, phrases and words to describe why foods were chosen	Groups of codes that represent the same idea	Groups of categories that represent the same concept	

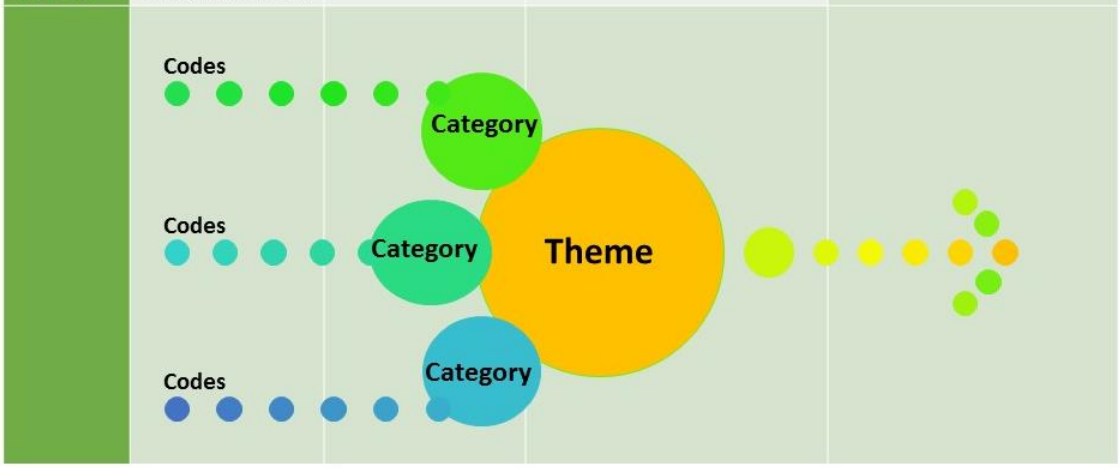


Figure 4.9 Conventional Content Analysis plan for Action Cycle 3 and 5

Worksheets

On the second Discovery Day, each group had to submit a final menu. On the back of the menu were the reasons why children chose food items on the menu. The researcher collected the worksheets after presentations. The worksheets were viewed several times to gather information and served two purposes. Firstly, to verify the categories and themes that emerged from the transcripts. Secondly, to allow the researcher to classify menu items as 'green', 'amber' and 'red' to get an overall proportion of healthy and unhealthy foods that were being chosen by children.

4.6.2 Purpose-designed semi-structured group interviews

Data collection and management

Two teachers who were on the project team were given questions (Table 4.1) on a sheet to use in a class discussion with room to record the answers. Results were recorded and emailed to the researcher within a month. Numerical data was transferred to Microsoft Excel. Qualitative data was recorded from open-ended questions and transferred verbatim to Microsoft Excel.

Data analysis

Basic descriptive statistics (total number, averages, and percentages) were summarised and used to interpret the numerical data. Answers to open-end questions were compared with categories and themes when the data was synthesised and interpreted together at the end (section 5.6).

4.6.3 Canteen data

Data collection and management

A project team member spent a day in the canteen observing, collecting and recording information on; what food and drink was available on the menu; how the food and drink were prepared including brand information of ready-made products; food items pre-ordered in the morning for lunch; food items bought over the counter at recess and lunch time. Recorded data was emailed to the researcher and entered into Microsoft Excel.

Data analysis

The Tasmanian School Canteen Product List was used to classify food offered and purchased into three categories; ‘green’, ‘amber’ and ‘red’ (202). The exception was sausage rolls, pies and chicken nuggets. Because some brands were classified as ‘red’ options, and some ‘amber’, for the purpose of this study they were all classified as ‘red’. Basic descriptive statistics were used to interpret the data.

4.6.4 Small-scale pilot intervention.

Data collection and management

Spaghetti bolognaise was offered as a lunch order for one day. The researcher provided guidelines for the preparation of the meal, which was prepared onsite that morning. The parent on the project team recorded the number of meals purchased for lunch. The parent also observed the waste and recorded her observations on paper throughout the lunch break. The team member collated and recorded the information onto Microsoft Excel and emailed to the researcher for analysis.

Analysing the data

Basic descriptive statistics were used to describe the data.

CHAPTER 5 FINDINGS

The findings will be presented in two sections; as they were collected for each individual cycle and then as integrated concepts. This chapter will describe the development of the action cycles as separate entities but will highlight the connections between the action cycles (summarised in Figure 5.1), their findings and the emerging concepts.

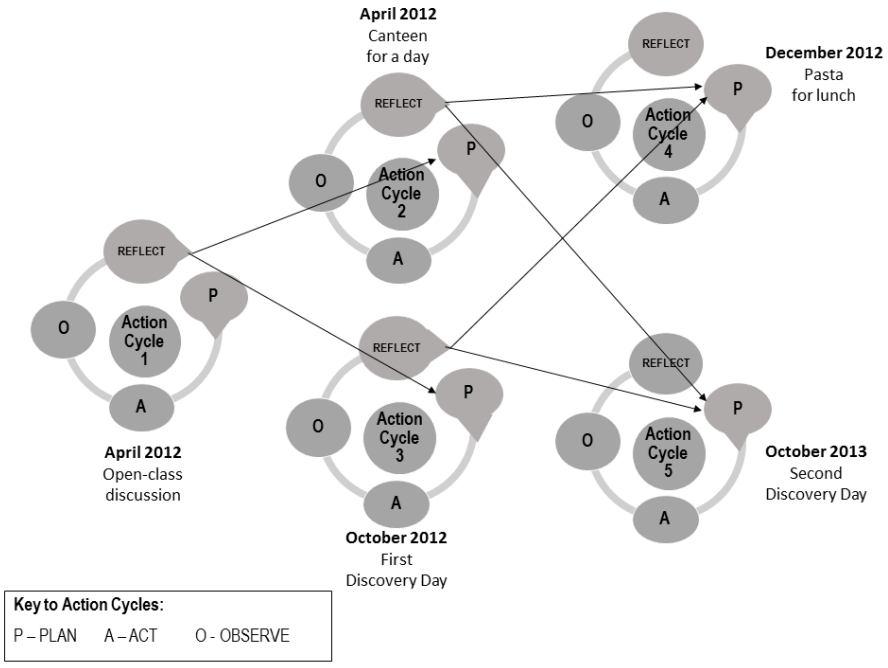


Figure 5.1 A conceptual map of the five action cycles

5.1 Action Cycle 1 (open-class discussion)

Action Cycle 1 was an open-class discussion, where the canteen played a central role in the exercise. Considering the cognitive development stage of this age group, the canteen served as a visual to give children a physical context that they could relate to during the exercise. Two teachers facilitated open-class discussions during class time with grades three, four, five and six. Group one included of 26 children and group two included of 54 children. The children were sitting in front of the teacher while answering the open questions about; who *purchased food* from the canteen in the previous week; what food they *favoured* in the canteen; what food they would *like to be available* in the canteen; *what they knew* about healthy eating; what *healthy choices* they would choose; and *why they liked* that food. Results were recorded by the teacher on paper and emailed to the researcher.

5.1.1 Purchased food

Including group one and two, the discussion revealed that 69 of the 80 children (86 per cent) *purchased food* from the canteen during the previous week. This is a large percentage of the total cohort, highlighting the importance of the canteen in a school setting.

5.1.2 Favourite food

Children put their hand up and shared their favourite food and the details were recorded by the teacher. The favourite foods were classified as ‘green’ (healthy), ‘amber’ and ‘red’(unhealthy), according to Guidelines for Healthy Food and Drinks Supplied in School Canteens (244). The only exception was chicken nuggets, pies and sausage rolls, which were classified as ‘red’ for this study. The foods were then itemised into similar food types. Of the six most popular foods types reported; four were classified as ‘red’, one was ‘amber’ and one was ‘green’ (Table 5.1).

Table 5.1 Top six favourite foods in the canteen (children can vote more than once)

Food classification	Food type	Number of votes
Red	*Confectionery (including 5 varieties)	83
Red	Crisps	49
Red	Ice cream or icy poles	35
Green	Salad rolls or wraps	30
Red	Chicken nuggets	23
Amber	Pizza	23

*Confectionery included five different food items; killer pythons, yoghurt babies, raspberry twists, lolly faces and yoghurt frogs

5.1.3 Like to be available

Both groups of children (n=80) were separately asked what foods they would *like to be available* in the canteen. The results were combined and the most popular foods included: confectionary; ice-cream and icy-poles; nachos and tacos; pasta dishes; rolls and wraps; and processed chicken (Table 5.2). The most popular food choices were grouped on the basis of similar nutrient content and classified as ‘green’, ‘amber’ or ‘red’, as shown in Table 5.2 .

Table 5.2 Foods which children would like to see offered in the canteen

Food classification	Most popular food choices
Green (healthy)	Spaghetti Bolognaise/lasagne/pasta Rolls/wraps Pancakes Fruit
Amber	Nachos and Tacos Butter chicken Pizza pockets
Red (unhealthy)	Confectionery Chicken nuggets/strips/popcorn Hot chips Ice cream

5.1.4 What they knew

In the next section, the terms healthy and unhealthy foods will be used, rather than ‘green’, ‘amber’ ‘red’, as teachers spoke about healthy and unhealthy foods with children. The exercise was to explore what children understood about healthy food, this resulted in a range of responses including; vegetables and fruit, wholegrain food, food high in vitamins, natural and unprocessed food without preservatives, food that is good for your body to grow and keep fit. The results revealed that children did display an understanding of healthy food.

5.1.5 Healthy choices

To develop a further understanding about children’s food choice, the same cohort were asked to give an example of healthy foods. Their responses included; nuts, pasta, water, fruit juice, berries, fresh fruit, salads, dark chocolate, yoghurt, meat, seafood, rice, carrots, apples, tomatoes and vegetables. When the children were asked to provide some healthy options that they would like to have available in the canteen to purchase, they suggested rolls/wraps, pancakes, fruit and pasta dishes. Children identified individual foods but saw the canteen as a provider of complete meals.

5.1.6 Why they chose

After the class discussion about healthy and unhealthy foods, the teacher asked each group to provide reasons why they chose unhealthy foods as a preference (confectionary, crisps, chicken nuggets, hot chips) and recorded the reasons provided. The reasons included taste, flavour, quick, easy, cheap, available, filling and hot food warms you up.

5.1.7 The next steps

A Participatory Action Research (PAR) approach requires observation and reflection of the data at the end of each cycle to determine the form the next action cycle will take. During the reflection process, the project team discussed the answers that children provided about why they made particular food choices. The team agreed that the answers children provided was different to what they expected, and it was unanimous that this was an important area to explore further. The other observation that evoked discussion was curiosity about what children actually purchased from the canteen; did their report about what they like to order match what they actually ordered? The reflection on Action Cycle 1 made it clear that two further action cycles were required. First, to gather more data about the children's current school food environment by collecting information about food prepared, offered and purchased in the canteen (Action Cycle 2). Second, it was recognised that more data collection would be required as the data from Action Cycle 1 indicated that children could provide a rationale for their food choice. At this stage, the phenomenon was not fully understood and therefore further exploration was necessary to develop a better understanding of children's food choices (Action Cycle 3).

5.2 Action Cycle 2 (observation of the canteen)

During this cycle, data was collected about foods offered, prepared and purchased from the canteen on a randomly selected school day. Any child who bought food from the canteen on this day was included in this action cycle. Food was categorised using the Tasmanian School Canteen Association Product List, which was based on the Guidelines for Healthy Food and Drinks Supplied in School Canteens (37, 244). Accordingly, foods were categorised into three groups; 'green' (healthy), 'amber' (contains both healthy and unhealthy elements), and 'red' (unhealthy). The only exception was the categorisation of pies, sausage rolls and chicken nuggets, which will be classified as 'red' food for this study.

5.2.1 Foods offered

The canteen menu contained 43 food and drink options and approximately two thirds (60 per cent) of the options were ‘green’ (30 per cent) and ‘amber’ (30 per cent), while 40 per cent were categorised as ‘red’ choices. The Tasmania Cool Canteen Accreditation Program (CAP) and the National Healthy School Canteen guidelines recommend that to achieve bronze accreditation, 75 per cent of the menu should be mostly ‘green’ options with some ‘amber’, for silver accreditation the menu should be 85 per cent ‘green’/’amber’ combined and gold accreditation should be 100 per cent ‘green’/’amber’ choices. The canteen in this project is below the level for bronze accreditation.

5.2.2 Food preparation

Nineteen percent of foods offered were prepared onsite, including salad rolls/wraps, toasted sandwiches and burgers using pre-prepared ingredients (e.g. processed chicken used for the wraps). The remaining foods offered on the menu were commercially prepared, packaged and ready to serve (or heat and serve).

5.2.3 Food purchased

The food purchased from the canteen included lunch orders and those bought over the counter during two breaks (recess and lunch). Ninety-five children from kindergarten to grade six placed a ‘lunch order’. Of the 320 individual food items ordered for lunch, 258 (81 per cent) were ‘red’ foods, 22 (7 per cent) were ‘amber’ foods and 40 (12 per cent) were ‘green’ foods. Note that one order might have three party pies and a drink, which would equate to four individual items.

It was recorded that 529 items of food were purchased over the counter at recess and lunch by children from kindergarten to grade six; 98 per cent of these food items were ‘red’ foods, 1.7 per cent were ‘amber’ and 0.3 per cent were ‘green’. While more children purchased ‘green’ food choices as a lunch order compared with their choices during the breaks, ‘red’ foods still dominated.

Overall, the majority of the food items that were purchased from the canteen were ‘red’ foods (92 per cent). The proportion of ‘amber’ and ‘green’ foods purchased was lower, 3 per cent and 5 per cent respectively (Table 5.3), even though ‘amber’ and ‘green’ foods were available on the menu. The most popular foods purchased from the canteen were classified as ‘red’ foods (Table 5.3).

Table 5.3 Nine most frequently purchased foods from the canteen during one-day classified into Red, Amber and Green foods

	Food type	Lunch order	Over the counter	Number of total items sold	Percentage of total items purchased	Comments
Red	Confectionery	95	465	560	63.5 per cent	Many children bought more than one item on this particular day
Red	Chicken nuggets	110	46	156	18.0 per cent	Some children ordered in multiples
Red	Pies/sausage rolls	53	3	58	6.5 per cent	
Green	Flavoured milk	36		36	4.0 per cent	
Green	Chicken burger (with lettuce, tomato, mayo)	23		23	2.5 per cent	White roll
Amber	100per cent fruit juice	14	3	17	2.0 per cent	
Amber	Frozen pizza	14		14	1.5 per cent	
Green	Ham/cheese or cheese sandwich	13		13	1.5 per cent	White bread
Amber	Paddle pops/icy poles	6		6	0.5 per cent	These were not separated in the data collection

5.3 Action Cycle 3 (Discovery Day one)

The Discovery Day one was designed to uncover more about children's rationale for food choices and was guide by the De Bono's thinking hats concept. The idea was for children to design a healthy canteen menu using a worksheet based on De Bono's work (239) and then articulate their rationale for choosing their menu items. Children from grades two, three, five and six worked in groups to create 'healthy' canteen menus.

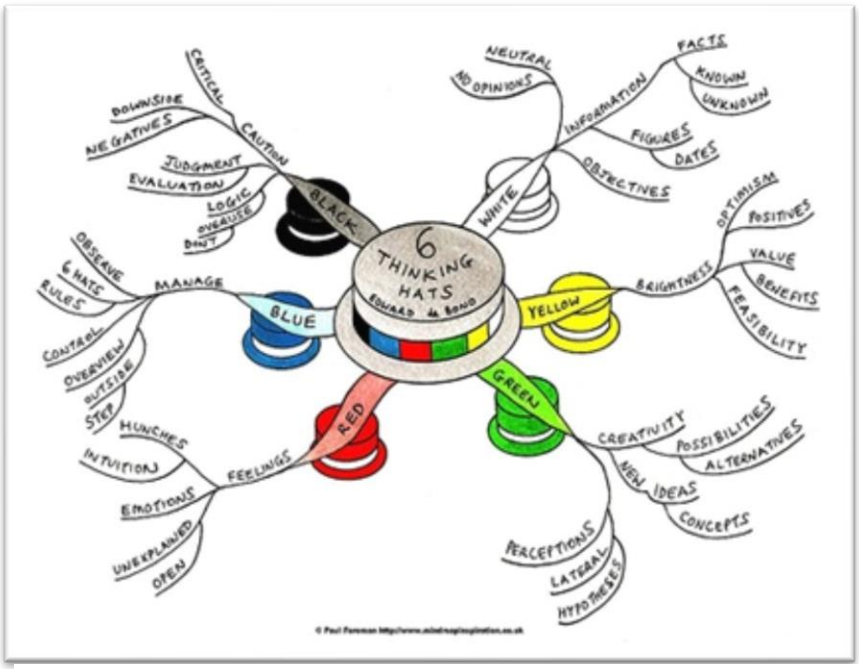


Figure 5.2 An example of how the six thinking hats have been portrayed

De Bono's thinking hats can be portrayed in a variety of ways, the teachers chose the version highlighted in Figure 5.2 to embed into a worksheet provided to each group as shown in Figure 5.3. Neither the worksheets nor the menus were collected after Discovery Day one.

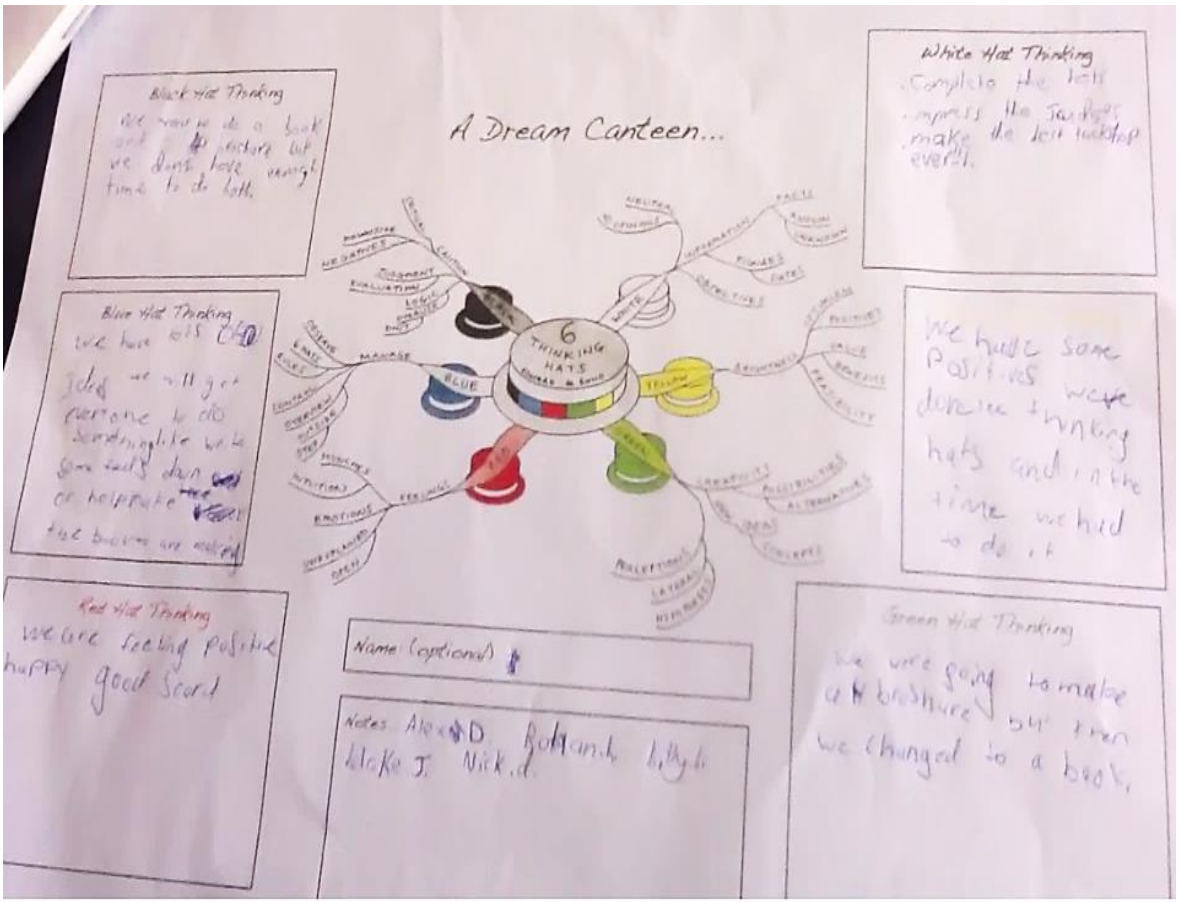


Figure 5.3 The worksheet used in Discovery Day one based on the six thinking hats

During the Discovery Day, seventeen groups (with five to six children in each group) were filmed in 78 short segments and viewed by the researcher. Videos less than 10 seconds were excluded from this research. Fifty-two segments were observed and reviewed, with 48 videos remaining that were audible and relevant. The audio from each of the 48 videos was transcribed verbatim for analysis. Analysis of the data from Action Cycle 3 was based on the videos and transcribed audio from the videos. In line with Hsieh and Shannon (241), the researcher read the transcripts in full and coded them line by line, codes with a similar meaning were developed into categories and discovering the links between the categories aided in developing themes. To gain multiple perspectives on the analysis, two co-researchers helped to inform the themes.

5.3.1 Emerging themes

At this stage of the research four themes emerged; knowledge, liking, consensus and uncomplicated drivers.

Knowledge

The videos revealed the menus developed by the children and across all of the 17 different menus filmed, unhealthy choices featured on all of them. The most common unhealthy choices were confectionary (including chocolate), processed meat, sugary drinks, hot chips savoury pastries and cakes.

There was also, for the most part, a clear understanding that although asked to develop a healthy menu that the group had chosen unhealthy options. This became clear as many children articulated – "*…most of them are junk food but we did put fruit on there and we have water".* Fruit and water were seen as healthy options, but also other food items such as salads *"We've got mangoes there, which is healthy"* and *"Salad because it is healthy and people will buy it"*.

The most frequently added healthy options included fruit and fruit salad, milk-based drinks, meat dishes, rice dishes and spaghetti bolognaise/lasagne. Many groups only identified fruit and water as healthy foods (*"…fruit to keep you healthy"*, *"water and fruit make you healthy", "water, because it's good for your heart"* and *"not just junk, lots of fruit")* while some groups identified other healthy options such as salad and milk (*"…we chose Caesar salad because we thought we should have some healthy stuff and some bad foods"* and *"milk because it is good for you and it's dairy"*).

Children articulated the possible effects of food classified as unhealthy from comments such as *"You get sick and vomit if eat unhealthy food*" and *"if eat garbage food you get sick. It happens to me with unhealthy food…."*. This suggests that children have a comprehension of adverse effects of unhealthy food.

It was discovered that children had different ideas of what a healthy food is. For example, some groups agreed that food from fast food outlets, were healthy options (*"Healthy…That is McDonalds…"* and *"KFC is healthy"*). One group explored food provided by fast food businesses using the internet, concluding that they are regarded as unhealthy options (*"we thought it was good food but if you're going to eat it you're going to get fat"*). Sugary foods were seen as having healthy or useful elements (*"sugary things for diabetes"* and "*Like doughnuts to keep your heart going")* but also seen as something to avoid *"diet coke because it doesn't have as much sugar"* and *"I'm not allowed to eat sugar, it bounces up my levels really high").* Some ideas about food were technically correct (*"Pies are healthy because they have meat in it and some unhealthy food too"* and *"Energy drinks on sports day to give you energy*') but that does not mean they are good choices.

Liking

Categories (such as tasty, favourite, nice, like and yummy) formed from many repeated codes of children describing a liking for a food. Thus, the theme of 'liking' emerged and was supported by quotes such as *"it's very nice", they're a favourite type of food", "yummy stuff", "they're good tasting" "most people would like them"* and *"we voted on what food we liked".*

Consensus

The quotes that support a form of consensus are presented here. Through the analysis of the data, it was found there were two levels of consensus. The first level was assumed popularity; food was chosen based on what children thought their peers would like (*"hot chips because they are popular and everyone likes it", "lollies because lots of people love them", "everyone loves KFC"* and *"sweet drinks because people don't like water"*). The second level was about voting. Children expressed that groups voted on what foods to include on the menu (*"…because it had the most tally's"* and *"…because we voted…"*). This is quite different from peer pressure, it relates more to social norms and role modelling because students want to go with the flow, and appear happy to make choices with the majority.

Uncomplicated drivers

Children articulated a range of factors they considered as reasons why they chose particular food. The influence of the weather was a common theme, with hot food being desirable on cold days (*"hot chips because people want on cold days"*) and cold food on hot days (*"we chose slushies because people might want them on hot days…same for juice"*).

Children expressed their own version of logic, which was not specific to foods being unhealthy or healthy (*"Energy drinks on sports day to give you energy", "We have Sushi Tuesday, why not cake Fri? People are tired on Friday, end of week*" and *"Ice-cream because it is cold"*).

5.3.2 The next steps

In reflection on this cycle, the project team concluded that children required a further opportunity to express a rationale for their food choices. Most menus contained a range of food items, however, the reasons children provided as to why they chose these items were limited. Data sufficiency was not reached and therefore, a second Discovery Day was planned to focus on children's rationale in relation to their food choices and this became Action Cycle 5.

Findings from Action Cycle 2 and 3 were considered at the same time in order to plan Action Cycle 4. Action Cycle 2 showed that despite the availability of 'green' foods, students purchased mostly 'red' options. Action Cycle 3 provided a limited insight into children's rationale for choosing food. Action Cycle 4 built on the children's criteria identified in Acton Cycle 3.

5.4 Action Cycle 4 (pilot a lunch option)

Action Cycle 4 was conducted with schoolchildren from grades two to six (n=235) who were given the option to order from the canteen menu as well as spaghetti bolognaise, a healthy food item. The spaghetti bolognaise was based on a healthy recipe provided by the researcher, incorporating children's criteria.

There were 108 serves of spaghetti bolognaise ordered for lunch, which equates to a 43 per cent uptake of a healthy option that met criteria that children expressed as being important. A project team member checked the bins intermittently during lunch to observe waste and reported that most of the meals were eaten with minimal waste.

Action Cycle 4 showed using children's rationale can positively influence their food choice. This was demonstrated by the great uptake of the spaghetti bolognaise choice and the minimal waste. At the conclusion of Action Cycle 4, the project team decided not to repeat another cycle as at this stage it had become clear that children's food choices could be influenced by using their own criteria.

5.5 Action Cycle 5 (Discovery Day two)

On the second Discovery Day a simple diagram of De Bono's thinking hats was used as a worksheet (Figure 5.3). Children had to develop a menu containing five foods and three drinks and had to document why they chose those items. No emphasis was placed on the menu being healthy as the focus was on understanding the rationale that children use for any food choice. There were 23 groups, with four to five students in each group and over the course of the day 27 video clips were taken.

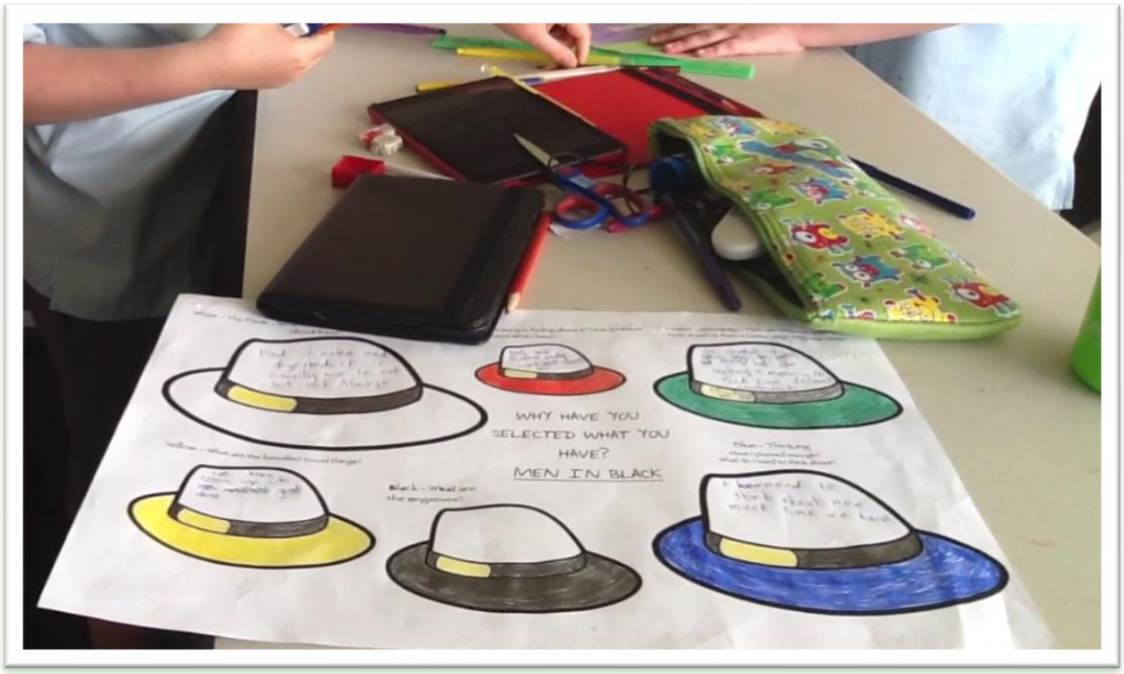


Figure 5.4 A picture of De Bono's thinking hats given to each group on Discovery Day two

Students were able to use a variety of means to brainstorm and develop their menu. As shown in Figure 5.5, this group used a white board to put their menu ideas together.

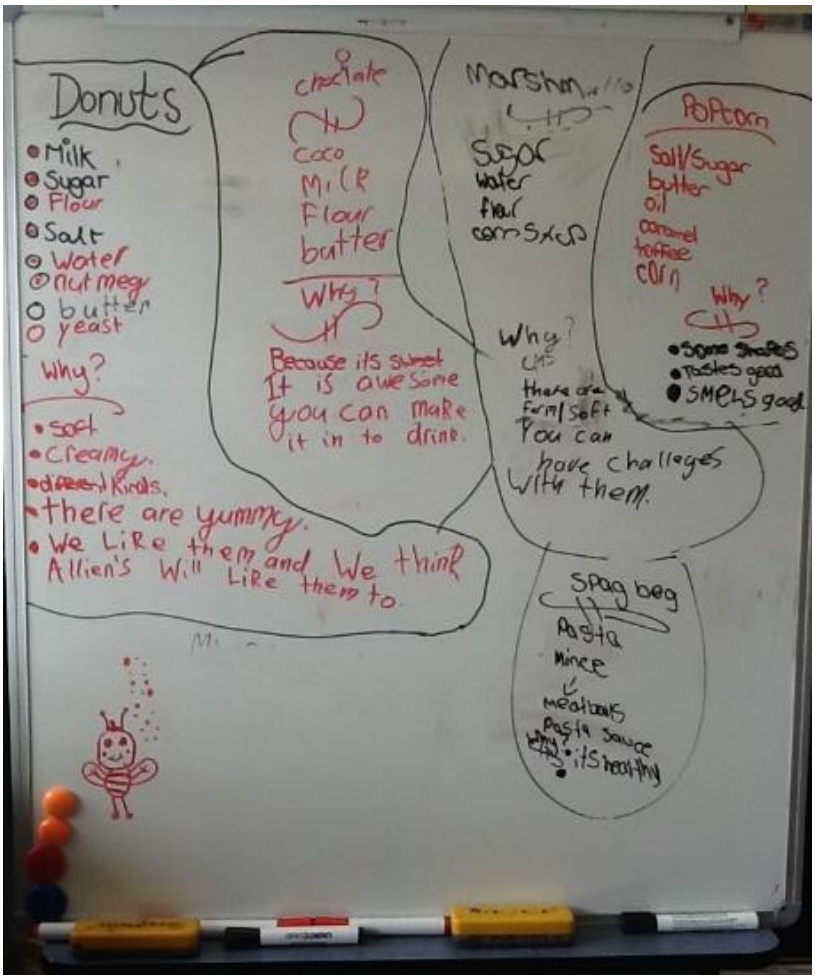
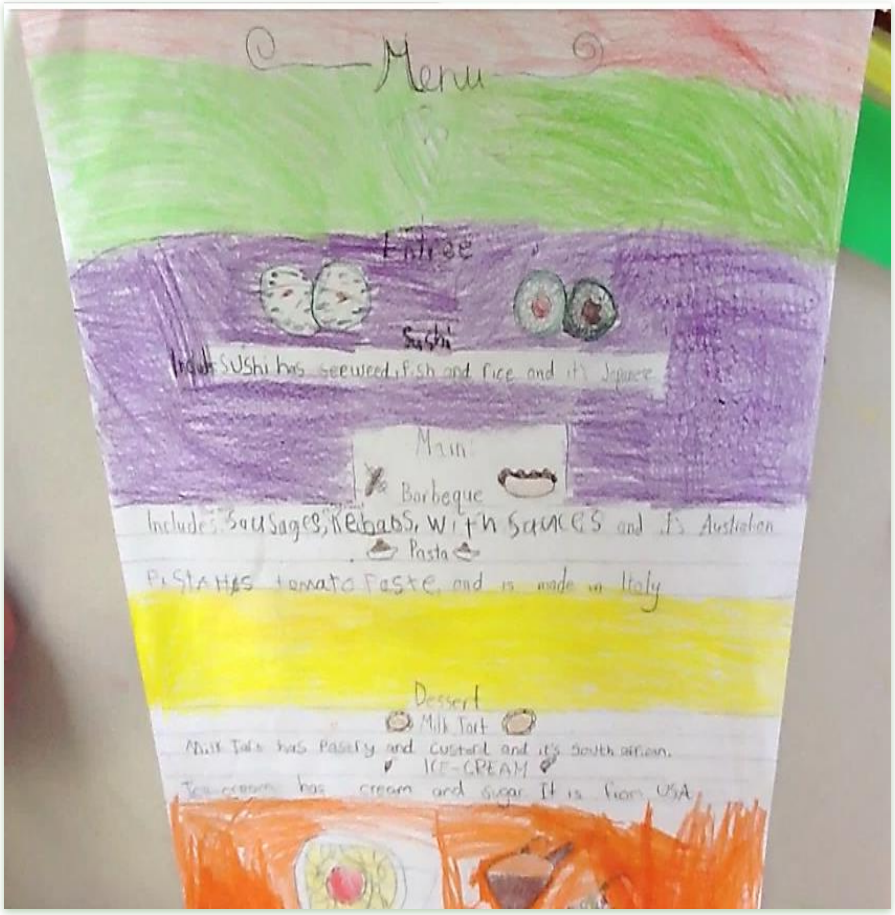


Figure 5.5 The whiteboard was one method used for brainstorming

Groups were given a piece of blank, white A3 paper to create their menu, no further directions were provided about how it should look (Figure 5.6)



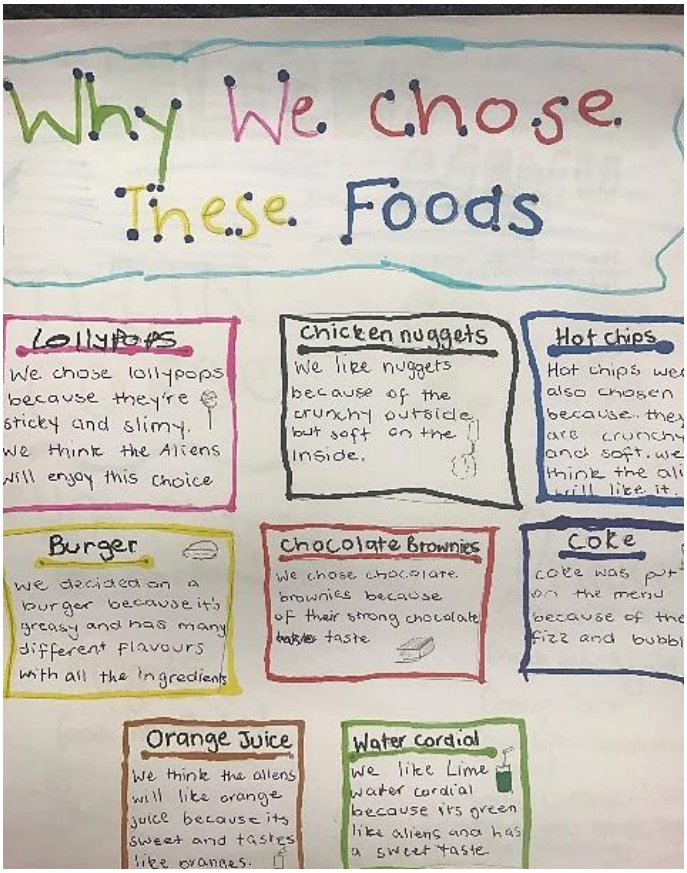


Figure 5.6 Examples of menus produced by the groups

From the 27 video clips, the audio from 24 videos was transcribed verbatim for analysis.

Analysis of the data from Action Cycle 5 was based on the videos, transcribed audio from the videos and worksheets. Like Action Cycle 3, Conventional CA was in line with Hsieh and Shannon (241). The researcher read the transcripts in full and coded them line by line, codes with a similar meaning were developed into categories and discovering the links between the categories aided in developing the themes. To gain multiple perspectives on the analysis, one co-researchers helped to inform the themes. As part of the analysis, the codes, categories and themes were mapped out as shown in Figure 5.7.

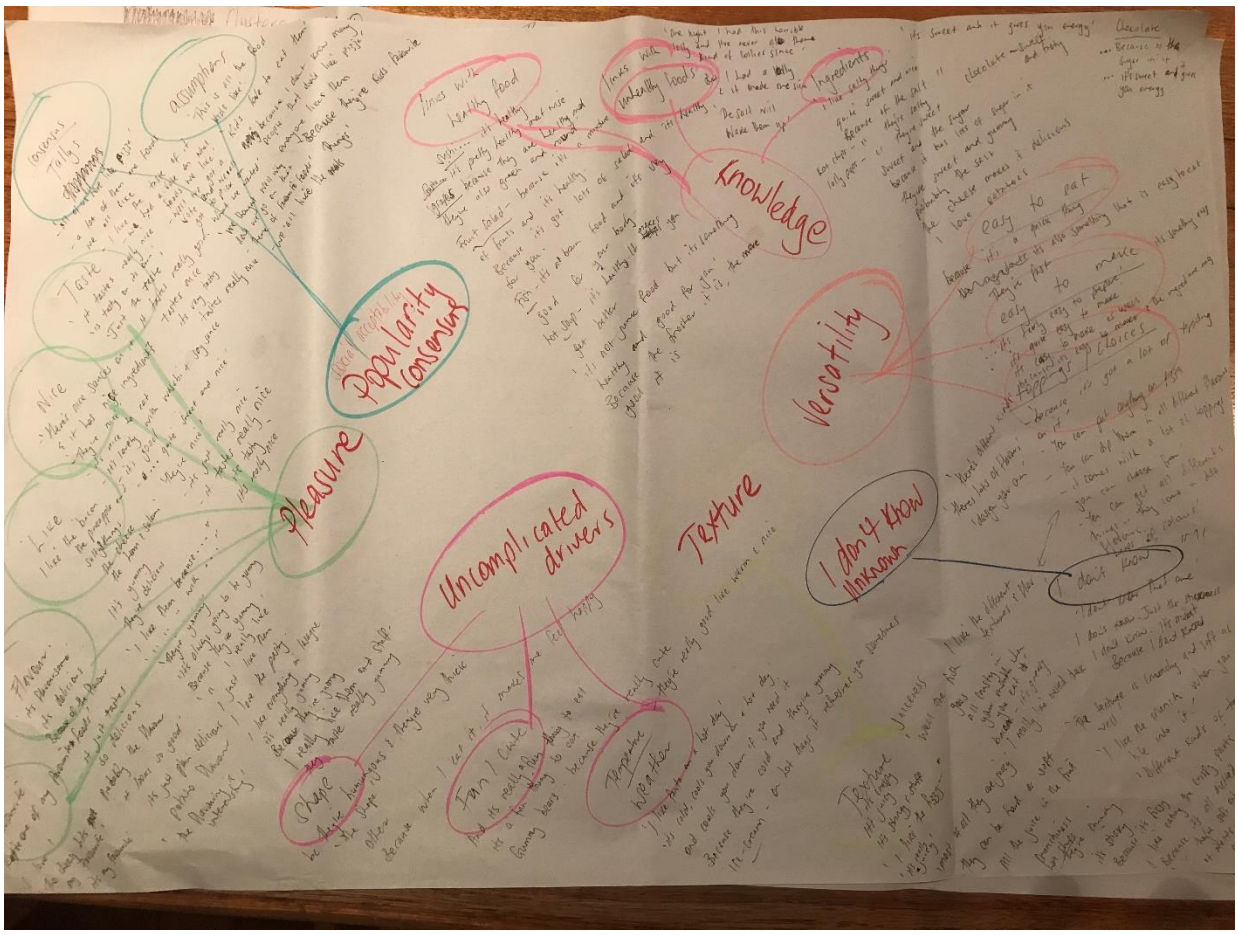


Figure 5.7 Codes, categories and themes were mapped as part of the analysis

5.5.1 Emerging themes

Six themes emerged from this Discovery Day as displayed in Figure 5.8 and described below.

Knowledge

Although there was no focus on healthy options in this Action Cycle, children understanding of healthy food allowed them to choose these items to be included on the menu. For example, Sushi - *"It's healthy and fairly easy to prepare"* and Fruit salad – *"Because it's a mixture of fruits and it's healthy"*

There was also an acknowledgement of properties that made a food healthy (Fish – "Because it's brain food and good for your body", Burger - "Because it's got lots of salad and it's healthy for you", "Because the fresher it is, the more good it is") or connecting food eaten to a consequence ("But I had a lolly and it make me really sick", sugar – "because it is sweet and it gives you energy", "Tomato soup is a good meal because it's usually known as a food to prevent colds").

Pleasure

The category of pleasure is made up of the following codes taste, flavour, the food being 'nice' and 'liked'. By staying close to the data the noun 'pleasure' was a term assigned to explain the meaning of these codes.

Pleasure was articulated by the children through the following phrases: "I don't know that one. I like the taste of it", "Because of the flavour and – I don't know", "Because it tastes really nice", "…they just taste nice". Taste closely links with pleasure. This was also articulated through naming particular tastes; chocolate – "because it's nice and sweet", - Bacon – "I like salty things", hot chips – "because of the flavour and the salt", "popcorn, because it is nice and buttery".

Versatility

This category emerged from children describing foods that were easy to eat (hot chips - *"but it is also something that is easy to eat",* party pie - *"they're just like a mini quick thing)* and easy to make (Tomato soup - *"And it's easy to make as well, all you need is the can to open it and then put it in there",* sushi – *"it's healthy and fairly easy to prepare",* Pizza – *"because it is easy to make and the ingredients are easy"*).

Versatility also related to the range of options within a food, either a variety of shapes, colours or toppings to choose from (*"you can put anything on pizza",* Lollies – *"you can get them in all different things like love hearts, berries, pineapples, snakes and all that",* Pizza *"And it comes with a lot of toppings you can choose from",* Tacos – *"because you can fill it with anything you want").*

Texture

Children described many elements of texture as reasons why they liked certain foods, such as chocolate – *"because it melts in your mouth',* spaghetti bolognaise – *"I like all the different textures and flavours…", "I really like the melted cheese",* Grapes – *"because they are healthy and they're also green and round. But most of all, they are juicy",* Coke – "*because it's fizzy",* Fish and chips – *"I like eating the crispy parts".*

Eating context

This theme was initially named 'uncomplicated drivers' (Figure 5.8) but the researchers and supervisors felt this term did not fully explain the theme, thus it was re-named 'eating context'. Temperature of the food and the weather was a common theme among the groups. Temperature of the food was described; "*I like the flavour, the nice cold flavour", "it's hot and soup", "because they're cold and yummy",* national pies – "*And they're really good like warm and nice".*

And the weather was described as influencing the temperature of the food they preferred at that time; "I like Fanta on a hot day", ice-cream "it's cold, cools you down on a hot day", "hot chocolate in a cold afternoon in Tasmania"

Factors like 'fun' and 'shape' were also mentioned as being important components for making food choices; slushy - *"you always get brain freeze and it's really fun",* Python lolly – *"because they're humungous and they're very thick and they come in heaps of colours", "and it's really a fun thing to eat",* Gummy bears – *"because they're really cute"*

Social acceptability

Social acceptability was around consideration about what peers might like, not peer pressure but more like an assumed popularity; *"this is all the food kids like", "because I don't know many people that don't like pizza",* lollies – *"because they're yummy and everyone likes them",* spider drink – *"Because they're kids' favourite things".* Some groups used a voting system to choose food for the menu; *"we had a vote on what foods we like", "we all got to vote and we all got to pick on what we wanted …"*

5.6 Putting it all together

The study followed a PAR trajectory, the exact direction of the project was unknown beyond Action Cycle 1. Reflection between each cycle is key to the PAR process and presenting each action cycle in sequential order highlights the link between reflection and planning for the next cycle. Although the preceding sections have presented findings from individual cycles, in reality, and within the realms of action research, the action cycles occurred in an interconnected matrix.

The final part of the analysis is to interpret the findings as a whole; what commonalities exist to form theoretical concepts that represent the full data collection. When results were viewed across cycles, one theoretical concept emerged that did not drive food choice (knowledge) and five theoretical concepts emerged that did drive food choice (Figure 5.8, Figure 5.9 and Figure 5.10). This section allows for a transition into the Discussion chapter and some could argue that it does not belong in the findings section. However, it is important to move the reader from the idea of sequential action cycles to a matrix of cycles prior to the discussion.

The first step in the final part of the analysis was to integrate themes that emerged from the conventional content analysis in Action Cycle 3 and 5. Two of the themes, versatility and texture, were not strong in the first Discovery Day (Action Cycle 3) but strong in the second Discovery Day (Action Cycle 5), which had more thorough data collection. Figure 5.8 shows how the themes from Action Cycle 3 and 5 fed into the creation of the theoretical concepts.

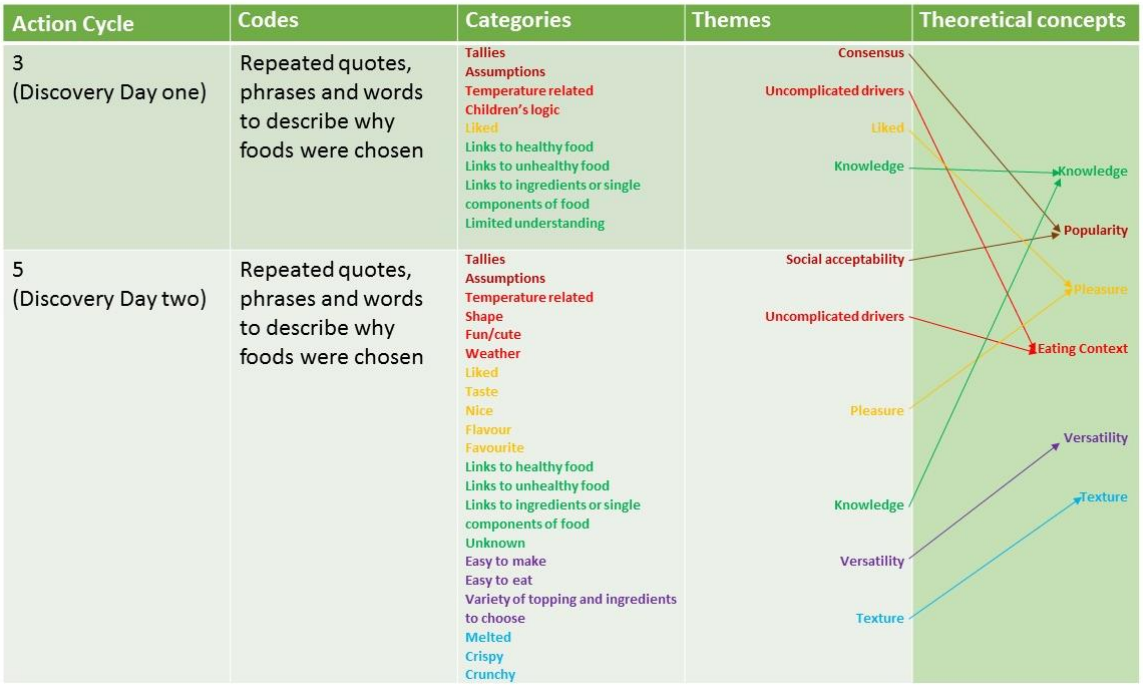


Figure 5.8 A summary table of the Conventional Content Analysis completed for Discovery Day one (Action Cycle 3) and Discovery Day two (Action Cycle 5)

Action Cycle 1, 2 and 4 were a mix of qualitative and quantitative data. The analysis was a mix of descriptive statistics and direct reporting from open-ended questions. Key data represented themes that had similarities with the emerging themes from the conventional CA and shown in Figure 5.9.

Action Cycle	Key data	Key themes
1	Children can describe healthy food but their favourite food available is unhealthy. When describing healthy food children say: It tastes good, more flavour, addictive, once tasted you want more. Quick, easy, cheap, can decide quickly, easy to make. Hot food warms you up, commercials are convincing, readily available, fills you up.	Knowledge Pleasure Versatility Eating context
2	Although healthy foods are available, dominant food purchased was unhealthy. The most popular food chosen from the canteen were: Easy to eat Warm Either sweet, salty and/or fatty	Knowledge Versatility Eating context Pleasure
4	The food offered for lunch included some of the emerging themes: Warm Salty (added cheese) Tasty Textural (cheese slightly melted) Popular Easy (used penne pasta for ease of eating)	 Eating context Pleasure Texture Popularity Versatility

Figure 5.9 A summary table of key themes that emerged from Action Cycles 1, 2 and 4

Together, there is a thread of similarities across the matrix of action cycles. When these themes are integrated, theoretical concepts emerge that are representative of the action research as a whole (Figure 5.10). Knowledge is a key concept that does not appear to influence children in their decision-making. The other five concepts (popularity, pleasure, eating context, versatility and texture) influence children's food decisions. Each concept was not expressed in isolation; it appears that the concepts collectively influence children's food choice. Each theoretical concept is reiterated here before moving onto the discussion.

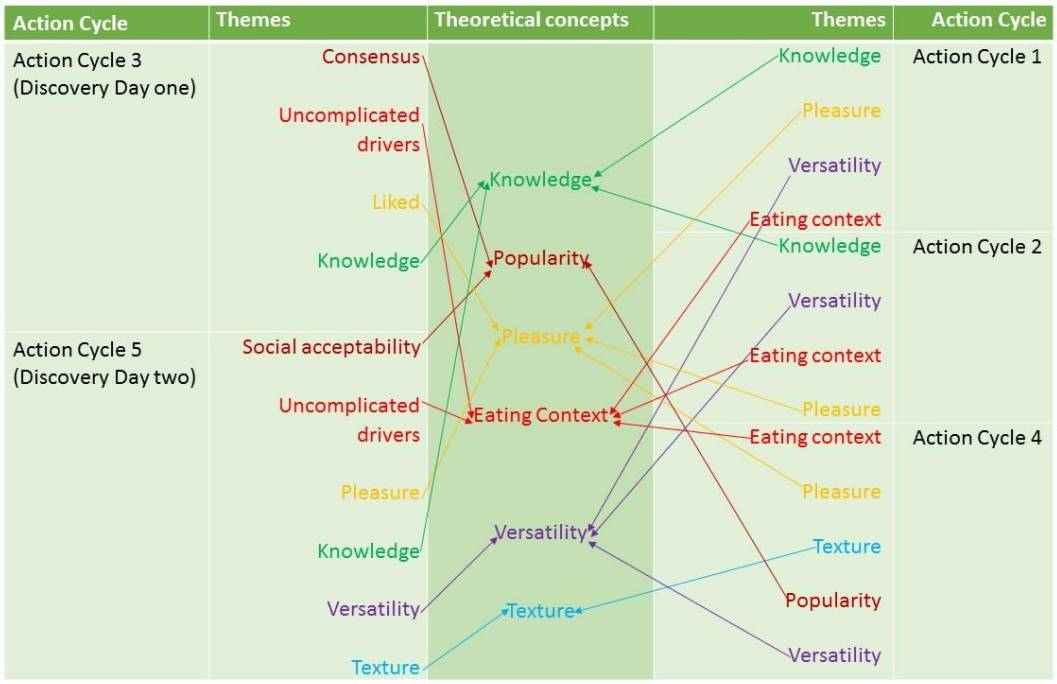


Figure 5.10 A summary table showing the integration of themes across all five action cycles to reach theoretical concepts.

1. Knowledge

This concept represents the notion that children demonstrated an understanding of what food is healthy (*"because it is a mixture of fruits and healthy"*) and what is unhealthy (*"it was all McDonald's and Hungry Jacks and food like that…but we knew the teachers would be looking for healthy stuff"*). Some of their perceptions where unique (*"like donuts to keep your heart going"*). Despite this understanding about healthy foods, unhealthy options were still predominantly chosen. While the children created a menu, they were also asked as a group to explore why they had selected these items. According to Piaget's cognitive development theory (145) the age group under investigation are not able to think hypothetically and therefore it became clear that they were expressing answers from a personal context (*"I like this food because…"*).

Most children related healthy options as fruit, salad, water, milk and spaghetti bolognaise/lasagne. This was evident through quotes such as *"…we chose Caesar salad because we thought we should have some healthy stuff", "water and fruit make you healthy"* and *"milk because it is good for you and it's dairy".* At other times, children's knowledge about what constitutes healthy foods was limited (*"Healthy. That's McDonalds…"* and *"…Like doughnuts to keep your heart going")* and sounded like the responses came from environmental or adult influences (*"if you have a pie, you should drink water that will push your levels down"* and *"if you're going to eat it, you're going to get fat"*).

There was also an acknowledgement of healthy food properties (fish – "Because it's brain food and good for your body", milkshake – "milkshakes because it's high in calcium") or connecting food and a consequence (*"But I had a lolly and it make me really sick"*, *"if eat garbage food you get sick. It happens to me with unhealthy food…"*, *"You get sick and vomit if eat unhealthy food"* and *"Tomato soup is a good meal because it's usually known as a food to prevent colds"*).

It became clear that knowledge did not translate to making healthy choices. Other research has found that in this age group, knowledge about what healthy foods are and why healthy foods are important for the body does not influence children to choose those foods (26, 102, 113).

2. Popularity

The concept of popularity evolved from two emerging categories; assumed popularity and a voting system. Some children based their decisions on assumptions about what they thought their fellow students would or would not like (*"hot chips because they are popular and everyone likes it", "because they're yummy and everyone likes them"* and *"Because they're kids' favourite things").* Within popularity the groups appeared willing to compromise depending on what they thought others would like. Within the other category a voting system, reflected an effort to cooperate or 'go with the flow' (*"we had a vote on what foods we like", "…because it had the most tally's"*).

3. Pleasure

The concept of pleasure started to emerge in Action Cycle 1 with codes such as *"it tastes good"* and *"once you've had a taste, you want more".* During the two Discovery Days, many groups responded with descriptions such as "*it's tasty", "nice", "I like the flavour"*. 'Pleasure' emerged as the name of the concept during Discovery Day two (Action Cycle 5) after realising it was a common descriptor across a range of expressions (such as taste, flavour, food being 'nice' or 'liked'). The concept around pleasure incorporates the following categories; satisfaction (*"Because it tastes really nice", "healthy but delicious"* and *"tasty, the cheese…makes it delicious")*, specific taste preferences (*"chocolate is sweet and tasty", "I like salty things")* and descriptors about liking the food in combination with taste motivations (*"Choc fudge – like because it's chocolate, choc is sweet and tasty"* and *"Popcorn, because it's nice and buttery"*).

4. Eating context

Children expressed aspects of food that did not fit with other concepts to describe their own needs and logic. On both Discovery Days children expressed wanted to have hot food on cold days (*"hot chips because people want on cold days"* and *" hot food warms you up"*) and cold food on hot days (*"it's cold, it cools you down on a hot day…"* and *"we chose slushies because people might want them on hot days…same for juice)*. Factors like 'fun' (*"you always get brain freeze and it's really fun"),* 'shape' (*Pancakes – "because I like them, the shape")* and an emotional connection (Gummy bears – *"because they're really cute")* were also mentioned as being important components for these children in making a food selection.

5. Versatility

The concept of versatility emerged initially from Action Cycle 1, Table 5.3 (*"quick and easy"* and *"easy to make"*). Versatility was an important motivator regarding choice of certain foods in Action cycle 3 and 5. It was related to ease of preparing food (*"and it's easy to make as well"* and *"because it is easy to make"*) and eating food (*"it is also something that is easy to eat"* and *"they're like a mini quick thing"*). Children also described a liking of food when there was a choice of toppings or flavours available (*"And it comes with a lot of toppings you can choose from"* and *"because you can fill it with anything you want"*), such as pizza and nachos. Finally, children expressed they preferred to have a choice, described as: *"And it comes with a lot of toppings you can choose from".*

6. Texture

The physical properties of a food were important considerations for children when selecting foods (spaghetti bolognaise – *"I like all the different textures and flavours…")*. If groups said they liked a food, the person filming the Discovery Day would probe with more questions to uncover what characteristic of the food the children liked. Children offered a further layer of explanation and on many occasions related to texture. For example, crispiness (bacon – *"…It's crispy and greasy,"* Fish and chips – *"I like eating the crispy parts")*, juiciness (fruit salad – *"the juice in the fruit"*, Grapes – *" most of all, they are juicy")*, fizz (Coke – "*because it's fizzy",*) and food that melted in the mouth (chocolate – *"because it melts in your mouth"* and pizza - *"I really like the melted cheese"*). These examples provide a guide to the type of texture that could be incorporated with healthy options to match some of the features of food that children find appealing.

5.6.1 Summary

Most of the children who participated used the canteen. Children were able to identify and describe what healthy food is, and yet favourite foods identified by children were predominantly unhealthy (‘red’). Children’s explanation for selecting these foods in Action Cycle 1 were various and led to two action cycles (Action Cycle 3 and 5) devoted to discovering more about this phenomenon. The research also collected information about the children’s current school food environment and the impact of trialling a lunch option using children’s own food decision criteria. The next chapter will discuss these findings in light of existing literature and describe how they informed the creation of a model for supporting children to make healthy food choices.

CHAPTER 6 DISCUSSION

The primary aim of this research was to discover if children themselves can articulate factors that influence their food choice and if there were shared decision-making criteria that primary children use for choosing food. While the literature review highlighted the importance of using a whole-of-school approach to promote healthy eating to children, the canteen was central to this research. Given the stage of cognitive development that primary school children are in, according to Piaget (141), they require a familiar and present object to explore their views as they are not able to think in abstract ways. Apart from canteens being central to the school food environment and the main provider of food in the school setting, it provided children with a familiar and concrete point of reference to explore their food choices. This discovery has led to a collective understanding of concepts that primary school children consider when making food choices in the school setting. The results from this study concur with international studies that indicate children should be key informants regarding what motivates their food choice (69, 106, 230).

The research resulted in a model developed by the researcher, which is presented first (Figure 6.1) before commencing the overall discussion. With this model in mind, the discussion will describe the ideal situation for health promotion activities in the Australian school setting. The discussion then explains how new knowledge generated from the research can move health promotion towards an ideal approach that can enhance the effectiveness of strategies aimed at improving children's eating behaviours. A closer reflection of the results in the context of choice and the school environment will ensue. Followed by a discussion on translating theory into practice with another, more detailed look at the model that was developed from this research. Finally, a discussion about implications for policy and practice will complete the chapter. This final section will highlight how the proposed model can be used to start a new paradigm for working with children in the school setting to support healthy eating behaviours.

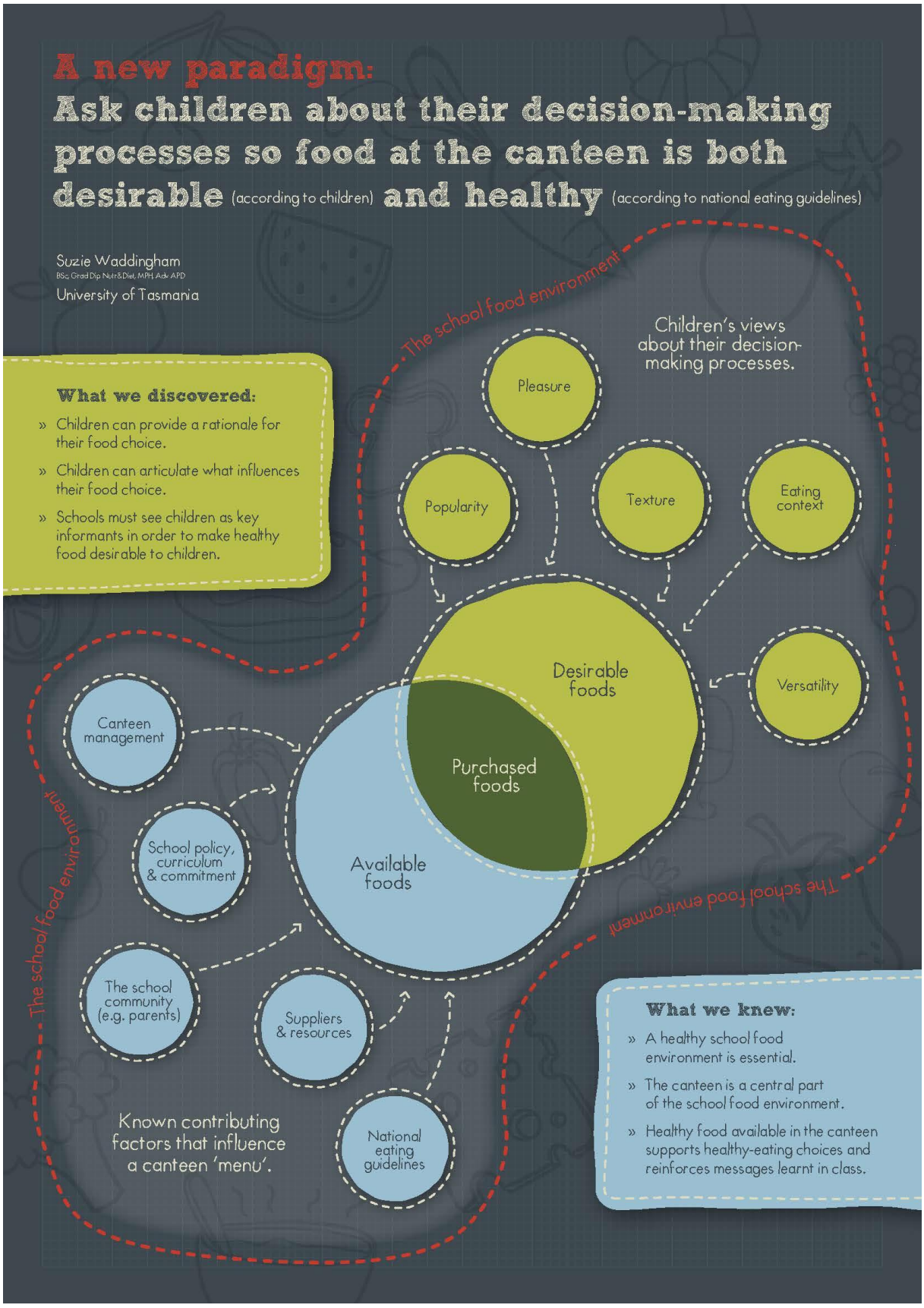


Figure 6.1 A model for influencing what healthy food is on the school canteen menu

6.1 What is the ideal?

Ideally, healthy food environments would be present in all Australian school settings because there is a global consensus that supportive environments can assist to make healthier food choices (5, 38, 55, 90). As discussed in the literature review, a healthy food environment represents consistent and credible healthy eating messages being included in all elements of the environment, with healthy food offered daily (repeated exposure) (26, 100, 245). The school food environment would encompass the curriculum, classroom, canteen, school community and school policy. Consistency is crucial because children appear to believe that school, and anything permitted at school, is inherently healthy (100).

Federal and state governments should embrace new ideas, commit to and allocate resources towards research led by qualified professionals and academics. Such a commitment will allow the evidence to build that will uncover the best way to achieve healthy food environments in all schools and change children's eating behaviours (5, 43, 245). The information discovered from the research should be incorporated in national, state and school policy, which is important given policies are known to drive nutrition interventions in Australia (181, 246). This commitment would be required on a long-term basis beyond the term of government. In addition to, a whole-of-school approach, strategies to change children's eating behaviours would incorporate the decision-making criteria of children, the key stakeholders. A whole-of-school approach to have healthy food offered within the school environment that matches the children's decision-making criteria), children will not only be offered and exposed to healthy food, it will be desirable to them and in theory, they will also choose it to eat. The long-term outcome of such a scenario would be a measured improvement in the eating habits of children as reported through Australian Health Surveys.

6.2 Achieving the ideal

The research presented here is fundamentally about exploring how we, as a society, get from A (current situation) to B (the ideal). How does Australian policy move forward using the evidence it has at a normative level and build on it to achieve the ideal; a healthy food environment being the usual state-of-play in the school setting and children eating healthy food during school hours being the social norm. At the beginning of this research, little was known whether children could provide decision-making criteria for their food choice or if they could articulate what influenced their food choice. The void of information coming directly from children was evident from studies that used parents as proxies for what children think in relation to food (18, 168, 170, 172). Many researchers have recognised the value of capturing children's perspectives about factors that influence their food choice (100, 247-249). However, there are limited studies that focus on children views about their decision-making criteria around their food choice (69, 211, 248, 250). In this research, Participatory Action Research (PAR) was used to discover new knowledge that will improve the impact of current approaches and move towards the ideal.

In the early stages of the literature review, a mind map was developed to highlight concepts that have been previously researched about the eating habits of children, and potential gaps (Figure 2.2). The figure portrays a complex web of connections, acknowledging the complexities and multiple levels of influence required to support the establishment of eating habits. The main point of this figure was to highlight that that the views from children was largely unknown. The school setting was used for the research, given that children integrate with school for much of their first two decades of life (26, 67, 79). The initial intention of the first action cycle, was to focus on uncovering reasons why children made the food choices they did and as a scoping exercise to establish a baseline of information about children's food environment and understanding of healthy food. The Action Cycles 1, 3 and 5 have found answers for the research question. Data collected during Action Cycle 2 and 4 provide context to the research and a point of reference for understanding children's school food environment.

Six theoretical concepts emerged allowing for the development of a model that can be used when addressing school food environment, including foods offered in the canteen. Some concepts presented which influence children's food decisions are in line with the literature. The findings from this research show that there are many concepts that work in combination (see Figure 7.2), and together they can influence food choice.

6.3 Knowledge created

A refined version of the original mind map (from Chapter 2, Figure 2.2) highlight concepts discussed in the literature review (green), the concepts that relevant to the topic but out of the research scope (blue) and new knowledge gained from this research (orange) (Figure 6.2). Section 6.3 details the concepts highlighted in orange.

Figure 6.2 Context of the research (yellow), concepts explored in the literature review (green), new knowledge produced (orange) and relevant concepts that are out of scope for this research (blue)

6.3.1 Main Finding: Children's decision-making criteria for their food choice

This study described reasons why children make food choices through the identification of six theoretical concepts; knowledge, texture, pleasure, versatility, eating context (such as hot food on cold days, shape) and popularity (what children think their fellow students would prefer and what was voted for). Our main findings concur with mostly international studies, which indicate that children should be key informants about why they make decisions (69, 100, 106, 230); however, not many studies have taken this approach. The theoretical concepts provide insight into reasons why children make food choice, which can be integrated into current interventions and policy aimed at children's eating habits.

Even though children understood some aspects of what constitutes healthy food, they still prefer ‘red’ food. This understanding supports other evidence that health knowledge is not a key influence for children’s food choice at primary school age (26, 102, 113). It is imperative to include health education in the curriculum, as health education supports consistency of health messages in a whole-of-school healthy food environment (26, 28, 72). Health education embedded in the curriculum will provide important foundations of knowledge as children grow older and start to consider aspects such as health in their decision-making around food (102), however it is not enough to alter unhealthy behaviours.

Using unfamiliar foods to test the impact of strategies aiming to influence food consumption could inadvertently incorporate neophobic responses in the data; using familiar foods are preferable in this type of study (124). This research identified foods that are familiar to children. Knowing which healthy foods are familiar to children provided a starting point when testing the acceptability of a healthy option for lunch in Action Cycle 4. Data from Action Cycle 1, and many menus from the Discovery Day, contained pasta. Therefore, pasta could be seen as a familiar and socially acceptable option. As such, spaghetti bolognaise was used as a menu option in the pilot. Decision-making criteria, as reported by the children in Action Cycle 1 and 3, was also used to develop a healthy lunch option for Action Cycle 4. The relevance of this cycle was that children were able to provide information about food options they were familiar with that could be manipulated to make healthier. Texture and pleasure were emerging concepts and spaghetti bolognaise with cheese also met these criteria. Given the theme around the weather was prominent, it was hoped this criterion could be incorporated as well. Due to delays in the pilot, the lunch option was tested early December, a summer month. Tasmania’s weather is generally cooler and cold days are often recorded in early summer (251). However, the temperature on the day of the pilot was not recorded therefore; it is not conclusive that this criterion was met. The pilot did indicate that using familiar or preferred food in combination with other children’s food choice criteria can improve acceptance of healthy foods and it is recommended that further studies of this type be conducted.

Sensory response to factors, like taste, can shape food preferences and eating habits (84, 102, 107, 124). All children are born with innate taste preferences, as articulated in the seminal works of Birch and Fisher (90, 156), and Drewnowski (102), which start to change when food is introduced and repeated food exposure occurs (84, 113, 126). Young children prioritise pleasure over logic or likely health effects (46, 84, 102). Other variables, such as food in trend, calorie content, perceived diet and weight loss benefits, safety, convenience and socioeconomic factors, interfere with the translation of taste preference to food choice once children become adults (102, 126). As supported by evidence in the literature review (84, 103, 124, 252) and emerging themes from this research, it appears that primary school children still make food preference decisions based on typical innate tastes and tastes learnt in early childhood (sugar, fat, salt). This information is important to know when designing strategies and policy that direct what food is offered to children at school, especially as the ADGs are low in these nutrients.

Less research has been dedicated to exploring the links between other physical properties of food, such as texture, and food preferences (84, 102, 124). Children's preferred texture of food is not evident in the literature, however some claim that texture preferences depend how a child was introduced to solids (84, 124, 253). The results uncovered in this research provide an insight into some of the physical properties that children consider when making a food choice. Some of these include food that is crunchy, juicy, melted and crispy. These textures could be incorporated into healthy options provided to children in the school canteen, increasing the likelihood of food being appealing to children.

The concept of food versatility emerging from this research includes ease of eating the food and being able to choose from a range of ingredients in foods. Different aspects of versatility have been reported (69, 126). Liem and colleagues (126) conducted research that indicated a link exists between food preference and versatility among 7 to 12-year-old children. They found that children preferred a smaller size snack over a larger size and suggested that this was due to a reduced effort required to consume it (126). The research, however, did not ask the children involved in the study why they preferred the smaller snack size (126). Wansink and colleagues (69) did seek to understand children's decision-making directly from children. The reasons why children in the study were not eating fruit was because the size was too large, inconvenient and messy (69). Liem (126) and Wansink's (69) research relate to the 'ease of eating' aspect of versatility. Other aspects of versatility not so prevalent in the literature involves choice of toppings for particular foods. Ensuring healthy options are versatile (easy to eat and a choice of ingredients) could be another opportunity to guide children to make healthier food choices.

One novel concept not related to the food directly was labelled 'eating context'. Children alluded to criteria that were important to decision-making that related to meeting needs outside of pleasure, texture and versatility properties. For example, preferring hot food options on a cold day, cold options on a hot day, cute shapes and colour. These concepts contributed to an improved understanding of reasons why children make food choices. This holds the potential to improve the likelihood for children to choose healthy food options in the canteen. For example, in colder months, there could be a healthy, warm food option. In warmer months, there could be a healthy, cold option available. Food that is easy to eat can be offered, such as finger food. These parameters could be easily implemented using a canteen's existing healthy options. By manipulating existing menus to address children's decision-making criteria, the cost and effort to implement such changes would be minimal.

Another concept uncovered in this research was labelled popularity. Unlike peer pressure, the concept focussed on an amicable consensus; what children voted for or food they assumed fellow students would prefer. The concept was about the group deciding what they thought others would like through a process of consensus. This could be an indication that children are more willing to follow the steps of their peer's choices, rather than provide answers they think adults want to hear. Research among children elsewhere has also described a similar paradigm as social acceptability (35), friends 'norms' (46), normative frameworks (150) and social modelling or social norms (212). The involvement of older peers in the planning of foods offered in schools is supported in the literature as effective to evoke healthy behaviours (46, 212) and has the potential to increase the number of student who purchase healthier food options.

The popularity concept highlights a misconception with the way we create healthy food environments in Australia. There has been a focus on making healthy choice readily available and that availability will transpire to choosing and consuming these healthy foods. The popularity concept supports research elsewhere that children prioritise choices that they think are socially acceptable. The influence of peers in school is paramount in the modelling of eating behaviour and an unhealthy food environment can reinforce conformity to 'unhealthy norms', which negatively affects the intention to choose healthy options (46). However, this research shows that unhealthy food purchased from the canteen was still preferable to children, even when there were healthier options available. It could be argued that the project school did not have a healthy canteen menu, as only 30 per cent of food sold was categorised as 'green'. However, looking at the combination of healthy foods and foods with some nutritional value (categorised as 'amber'), the school provided 72 per cent of such foods, very close to the 75 per cent required for Bronze accreditation in accordance to the Tasmanian canteen accreditation program (202). Maybe this is an indication that more choices from 'green' and 'amber' categories are required to shift purchasing behaviour towards buying those options. Given this research supports evidence that children are influenced by social acceptability, the research could be repeated in schools with healthier environments (the other accreditation levels in Tasmania are silver and gold) to see if there is a ratio of foods offered that is more effective to influence purchasing behaviour.

Understanding the decision-making criteria for food choice is this starting point to develop effective health promotion interventions to change the food environment and social norms in schools (35, 46). The main findings have presented new ideas than can potentially sway children's food choice and reinforced other concepts. The results indicate that, while there is strong evidence that children prioritise taste over health effects when making food decisions, there is a range of other concepts that serve as important motivators for food choice in the school setting. Researchers have underscored the importance of incorporating the views of children when planning programs to improve their health (61, 100, 133). This has relevance to interventions intended for canteens within the school setting, given that foods offered in the canteen also have the potential to influence eating behaviour (28, 79, 174).

6.3.2 The canteen

Several studies have reported that when a canteen is operational at school many children will purchase food and drinks from it (17, 26, 68). This study also found that many children across four grades reported buying from the canteen in the previous week (86 per cent of 80 students asked). While such findings are not new, they do indicate that children are still accessing the canteen when available, thus validating that canteen popularity is still current and relevant to a Tasmanian school. This reinforces evidence that schools and canteens are an opportune setting to promote healthy eating among children and to provide a consistent healthy food environment (67, 68, 72, 174). Findings from this research supports the supposition that the school canteen is a valuable setting for healthy eating promotion to children.

The canteen is an integral part of the food environment and was used as a point of reference in the research, giving context to children when they were exploring their reasons for making food choice. Action cycle one served as a scoping exercise to establish if the canteen was used, what food was preferred from the canteen, what children would like in the canteen, what understanding did the children have about healthy food. By doing this first, research can be more meaningful as a baseline of information is gathered and findings can be discussed in context of the school. It also gave children a concrete base to explore their food choice, as described by Jean Piaget, children of this age are not able to come up with ideas and opinions of scenarios that are abstract or hypothetical (141). By getting the children to think about their own familiar canteen, they had a concrete and physical object to explore food choice.

The group of children in this study were able to articulate correct assertions about what healthy foods are, in line with other studies (100). The children provided good examples of the importance of healthy foods, concurring with the literature. Although there were also misconceptions about attributes of healthy food, it appears that it is not lack of understanding of healthy foods that led to the preference for 'red' foods. The findings show that having 30 per cent of healthy choices available did not translate to healthy purchases. It is unknown if this was because availability is not enough to change behaviour or if the environment needs to have a higher proportion of healthier options to change behaviour. At the time of the study, the school was not engaged with state health promotion programs (MWEW, Cool CAP) and did not have a nutrition policy.

A consistent healthy food environment is known to support eating behaviours (72, 100), but there are often contradictions between what the school teaches about healthy eating and what is provided in the school canteen (254). Nutrition education efforts within the curriculum need to be matched with a healthy food environment for sustainble behaviour change (78, 100). Hesketh and colleagues found a contradiction between the overt and covert messages children are receiving about healthy eating at school; children appear to believe that anything permitted at the school must be inherently healthy (100). While it is possible that the whole school food environment was not healthy enough to influence food choice, this was not assessed as the canteen was the focus of this research.

Favourite canteen foods reported, and purchased, were 'red'

Children will naturally prioritise innate tastes over other factors, such as likely health effects (46, 102, 113). 'Red' foods dominant in innate tastes - namely salt, sugar, fat or a combination of these flavours - are often linked to pleasure despite being deficient in quality nutrients. Children's preference for 'red' foods is established knowledge and validated by three action cycles in this study. We also found that many children are naming unhealthy foods as their favourites in the canteen and preferred to purchase mainly unhealthy options in preference to 'green' foods. These findings are similar to findings published in other studies (17, 27, 68, 148).

As emphasised above, food quality lies on a spectrum. 'Red' (unhealthy) food are at one end of the spectrum, as the nutritional content improves they become 'amber' foods and then at the other end of the spectrum, food becomes 'green' (healthy). It is possible we are trying to move children who eat a lot of 'red' food, and will be accustomed to sweet, salty and fatty tastes, to the other end of the spectrum ('green' foods), which meets children's nutritional needs but not their pleasure needs, too quickly. Fresh and healthy foods are typically perishable, high in nutritional quality and lower in fat, refined sugar and salt. In the middle of the spectrum is food categorised as 'amber'. 'amber' foods have elements of 'red' and 'green' qualities. They can be 'red' foods 'greened up' (for example, a processed product like a sausage roll with lower levels of salt and/or fat) or a 'green' food made 'amber' with salt, fat and/or sugar quantities that exceed the ADG (for example, a baked potato with bolognaise sauce with added sour cream and cheese). This research fosters professional debate whether 'amber' foods should only be based on the latter, 'green' foods. Primary school children are immersed in a concrete cognitive developmental stage {Wadsworth, 2004 #140}, and they are not able to think in abstract ways. Exposing children to food from the five food groups ('green' based foods), even if it is classified 'amber', can support them to become familiar with the five food groups. The alternative is that they remain exposed to 'amber' foods that are based on, and look like, 'red' foods.

Majority of foods offered were 'red' or 'amber'

Despite evidence informed guidelines, programs and research that emphasise the importance of having mostly healthy options available in the canteen (26-28, 68, 72), findings indicate that canteens are still offering unhealthy options. Findings elsewhere have also shown that canteens are not conforming to evidence-based recommendations (200). While data collected in this research supports evidence that canteens are still offering unhealthy options, the purpose of collecting the data was to put the canteen in context. However, this research does indicate that children can be valuable contributors to the decision about foods offered in the canteen by way of providing criteria to consider. The idea of mandating what food is sold in canteens is not a new concept and it is enforced by some Australian states. However, banning any food that is not deemed a 'green' food option is not supported by the literature (29, 32, 65) or this research. As part of the versatility concept, children like to have choice and as part of the pleasure concept, innate tastes still drive primary school children's food choice and innate tastes are at odds with 'green' foods. The debate about whether mandating what is sold in the canteen is an effective approach or not is outside the scope of this research. However, if there was a reform in canteen guidelines, as a first step it imperative to review previous guides and uncover why it did not work the first time, including the children in this formative work. Then, the redevelopment should consider the food decision-making criteria of key stakeholders, the children.

If decision-making criteria is used to develop a healthy option, will children choose it?

Pasta was identified in this study as a favourite 'green' food. Action cycle four explored the acceptability and feasibility of offering spaghetti bolognaise for lunch orders on one day. The lunch order was made fresh that morning based on a recipe used by the parent on the project team, who coordinated the meal preparations (fresh and tasty), with penne (easier to eat) and topped with grated cheese (salty and melted). The researcher provided guidance to ensure the meal was also considered a healthy option. The lunch was well received it is recommended that further studies are conducted to test this concept on a larger scale to evaluate if decision-making criteria, as reported by children, was integrated with healthy options, would it result in a healthy food decision. Although the pilot is not able to generalise that the concept is applicable to other settings, it provides enough evidence to support the value of repeating the study.

6.3.3 Discovery Day is an effective approach for collecting data with children

Inadvertently, this research successfully trialled a method for collecting information from children about food. The Discovery Day was an effective, non-invasive tool that can be used to discover the thinking and values of children including food preferences and reason why they make food choices. Using the school setting to conduct research is not novel; however, there is not a gold standard measure for collecting data with children. As described in Chapter 3, the Discovery Day was an approach that is aligned with the NSECHR for working with schools to collect data with children (217, 220, 225, 235). Other approaches used in the school setting to access data from children, are not conducted during a usual class activity and/or are time intensive (focus groups (100), laddering technique (69), libertarian paternalism approach (133), and questionnaires (72)). It has also been reported that children below grade five-six (this equates to 11-12 years old) are not able to self-report via a survey (27) and many studies use parents and teachers' perceptions. Since financial investment for public health research is scarce and time is limited for conducting research in schools, the Discovery Days were found as an effective and low cost approach for collecting data.

Childhood researchers have expressed how crucial it is to determine which food that children like and why, in order to better understand consumption patterns and how to modify them (35, 69, 100, 106, 230). There is a theory that to reach the real reason why people make decisions, people need to be asked 'why' five times (255). During Discovery Day two, the videos showed the researcher using a similar technique, in an attempt to unpack the layers of 'why' from the participants. Kohfedt (255) used a PAR framework successfully in a school setting to implement the five why technique.

6.4 Choice, the school environment and repeated exposure

6.4.1 Choice

This research did not intend to prove or disprove the effects of manipulating food choice among children. However, choice was a central element and the research endeavoured to understand children's approach to food choice in order to support them in creating healthy eating habits. In the long-term, achieving healthy eating habits is a public health imperative for all children. The results did achieve an insight into factors that children consider when making a food choice. These were expressed in six themes and have been discussed in detail already. Some of the concepts reinforced existing evidence, such as a preference based on innate tastes, food being easy to eat, social acceptability and sensory properties. The most novel concept was the way children contextualised their food, such as hot food on cold days, shape and fun. The research did suggest that children consider these themes collectively, not in isolation. This indicates that the more criteria a food meets, the more likely that food is chosen. This idea was supported in the action cycle four pilot where a food that met a range of decision-criteria was well received by students.

Another aspect of choice is whether children are provided with a selection of food, or not. It was emphasised in the literature review that 'forbidden' foods have a negative effect on the creation of a positive eating habit. There is evidence that foods labelled as forbidden can create problems. Once a food becomes forbidden, interest in that food increases (65, 256). Evidence supports the importance of food choice in the establishment of a food habit, however a completely unrestricted choice of unhealthy food is not recommended for forming a healthy habit either (132). Many interventions focus on improving diet quality rather than taste (pleasure) (102). An approach with a focus on diet quality alone may apply to adults (102), but children's food preferences are driven largely by taste (46, 84, 102). This study revealed that pleasure remains to be an important theme for food choice, however not the only one. This research also showed that when unhealthy food is available, students will choose to purchase that food. Previous points of discussion looked at the idea of having a mix of healthy food and 'amber' food that is made from healthy food with added popular tastes (sugar, fat, salt), rather than 'amber' foods that are unhealthy options that look the same but have been 'greened up'. This would satisfy the importance of including popular tastes, having choice and not having unhealthy foods available. The current NHSC guidelines do not distinguish between 'amber' options based on healthy foods or unhealthy foods in the recommendations.

6.4.2 School environment and repeated exposure

Providing repeated opportunities to try healthy food is another important element of a healthy food environment (128, 257). While our results showed that children did prefer unhealthy options in the canteen, Lakkakula et al. (128) and Weiping et al. (257) emphasise the importance of continuing to have healthy options available, and, that repeated exposure can result in better healthy behaviours over time.

There is substantial evidence in the literature to support the inclusion of a variety of food options in healthy food environment. By providing an environment that guides and positively influences children to make better choices, they will start to establish their own healthy eating habits. The key is to have processes in place to encourage children to try new foods and make better choices, based on their decision-making behaviours. Collectively, the findings of this study and those of other researchers does not imply that the solution is to dictate what children eat and deprive them of the opportunity to make their own choices.

The goal proposed by our project is to take the creation of healthy food environments one-step further and provide mostly healthy choices that align with the decision-making criteria that children use when making choices about food.

6.5 Translating theory into practice

The findings have been used to develop a model that can guide strategies aimed at improving children's eating behaviours in the school setting. The effectiveness of many school-based projects are not thoroughly evaluated to measure a change in eating behaviour (181) and the 2014/15 survey has shown us that children's eating habits are still poor (14). Therefore, a new paradigm is required to direct health promotion interventions in the school environment. This does not negate the importance of the family and home environment; the context of this research was to provide direction for action in the school setting.

This research showed that children have the potential to be the centrepiece of improving food choices within a school food environment. They can do this by helping increase the understanding of children's rationale and what influences food choice. Whilst there are a substantial number of innovative programs that are promoting health in the school setting, an effective improvement in the food habits of children will occur when their decision-making criteria is used to create the healthy food offered within schools. At the beginning of the discussion, the model that was developed from this research was introduced. The same models is presented again in Figure 6.3 and described in more detail. The intention of the model is to guide the development of strategies that aim to improve children's eating behaviour in the school setting.

The model represents foods offered and purchased in the school food environment. The environment is depicted as a red boundary (Figure 6.3) that encompasses foods offered in the canteen, as well as the children's criteria for choosing food. The environment highlights that the integration of foods offered with children's decision-making criteria can influence foods purchased by making food desirable to children. The bottom section (Figure 6.3) are concepts and connections that have already been established and discussed in the literature review.

While they are not part of the new knowledge gained from this research, it is important to provide context and to emphasise how the novel section of the model (new knowledge) adds to what was already known from the literature. Meaning, knowledge that has come from this research is in addition to, not a replacement of what is already known. The 'what we knew' section, shown in blue, conveys what influences the foods availability in the school canteen, which are important aspects to also consider when working with food offered to children in the school setting.

The top section of Figure 6.3 portrays information found in the research as theoretical concepts that can be used for planning nutrition policy and interventions for primary schools. The theoretical concepts in the 'what we discovered' section, in green, represents the children's decision-making criteria for choosing food. If available food meets the children's criteria, the food becomes more desirable, which is detail that the food industry appear to be aware of from as well (148).

When food is offered in schools, which in Australia relates mostly to a canteen or tuckshop where food is purchased in a 'take-away' fashion, three factors should be considered. Firstly, the ADGs (which is embedded in the NHSC guidelines) are still important to adhere to and guide interventions. Secondly, food offered in canteens come from the 'green' end of the spectrum, rather than relying on 'green up red' foods. Finally, children's decision making criteria (pleasure, social acceptability, texture, versatility, children's own logic) should be incorporated into healthy food options. As with any new paradigm, more research is required to refine the idea. However, as it stands, this framework can be used with the various forms of canteen accreditation programs that are in place across different states and territories without needing a major rewrite of the program. Discovery Days are recommended for accessing children's views during school time.

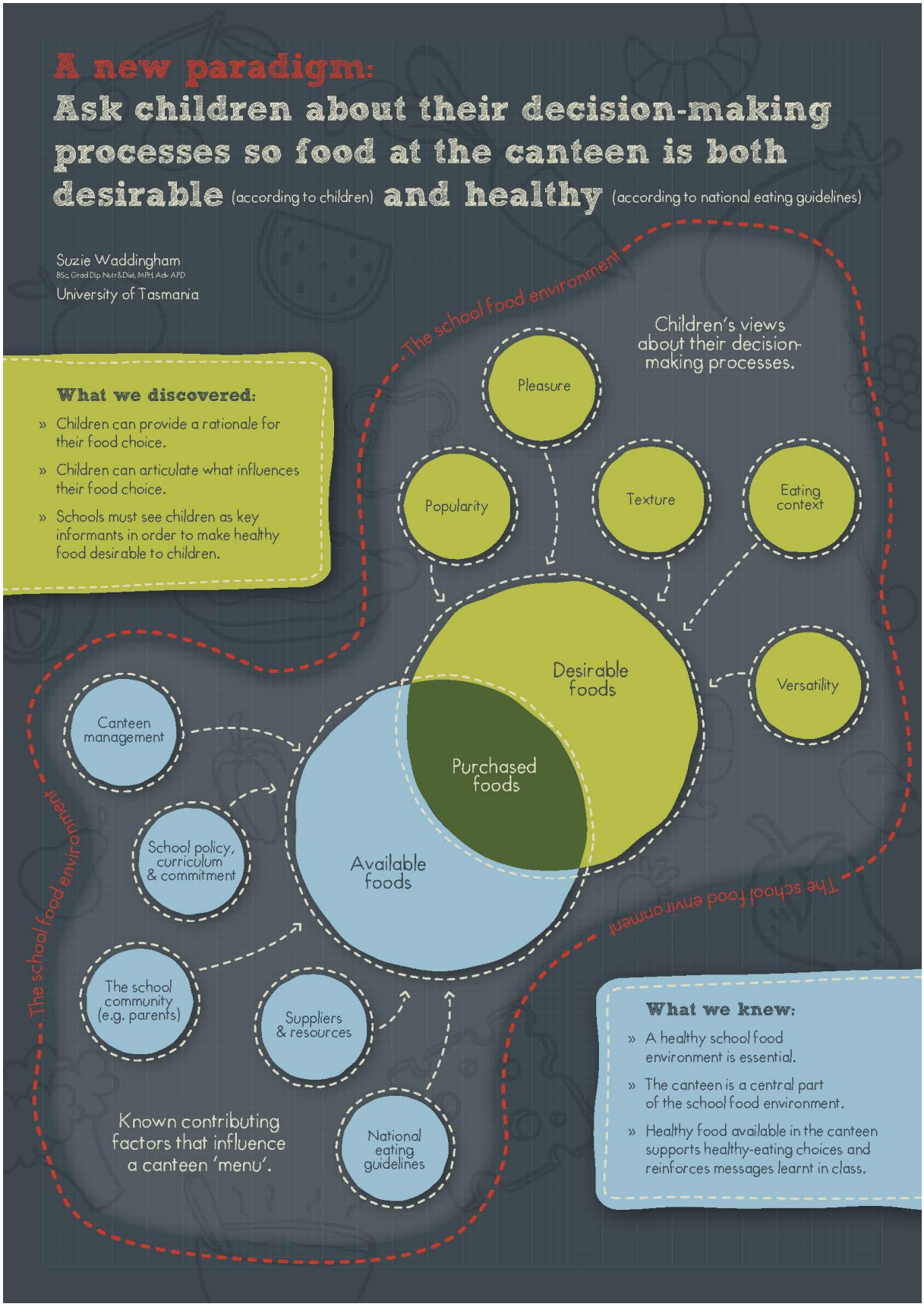


Figure 6.3 A proposed model for working with primary schools to improve the amount of healthy food eaten by children

6.6 Implications for practice

Translational research is fundamental for improving health status (43, 258). Translational science requires simplification and better communication of the evidence to make it easier for non-academics to decipher research outcomes (258). This can be achieved by translating the outcomes into practical tools (258), such as a model that can guide practitioners working with communities. Summarising the findings into a simple model that highlights the main research concepts makes it easier to incorporate the concepts into health promotion planning, policy development and further research in the area.

The model developed from this research emphasises that health promotion interventions require consideration of the individual embedded in their environment. The bottom section of the framework (Figure 6.2) summarises established concepts from the literature, which recognise the role of environments as supported by many health promotion models and theories, such as Ottawa charter (55) and SEM (53). The model acknowledges that supportive environments are a crucial part of the process to change eating habits. This section also highlights that strengthening school community action is an essential element of creating a supportive environment.

The research supports earlier statements that individual behaviour models, such as The Theory of Planned Behaviour, are not effective for guiding public health research with children as the environmental concepts are neglected. The top section of Figure 6.2 shows that this model has embedded key stakeholders, the children, within their environment by connecting children's decision-making criteria with the food available within the school food environment. While the results of qualitative research are not generalisable, a cohesive and shared narrative emerged to inform the results of this research. This shared understanding led to the model. Theoretically, the model will support the change of behaviours within a broader environmental context, improve the outcomes of healthy eating programs in schools and move closer to the ideal (described in section 1.3).

Theoretical models can assist planning for healthy public policy (246). There has been support for the development of healthy public policy globally since Ottawa charter (55) and more recently the Helsinki declaration on health in all policies and the Shanghai declaration (43, 50, 51). Policies can shape opportunities for people to make healthier choices (181, 182). The model developed from this research provides an opportunity to guide policy across states and territories where various strategies are implemented within the school to promote healthy eating. Most importantly, the model can be used as a checkpoint to ensure all concepts are considered collectively before embarking on a health promotion initiative in schools. When a model can translate across a range of different state and territory school-based programs, such that there is one model used nationally, the consistency and strength of action is increased (246).

Policies that influence food and nutrition are vital (43). Although policy formation is presented as a linear process, it has been acknowledged that in reality, policy formation and implementation is an iterative process driven by values and dependent on the social environment (43, 182). It has been recognised that policy is not always driven by research, evidence or the best possible approach (182). Policy makers use a range of information but academic research is not often one of them (258). Improving the communication of the evidence to policy makers by translating research outcomes into practical tools can improve the potential of evidence being translated to policy (258). This must be done in a way that it incorporates the views and experiences of the community (258). Developing a model, which summarises the main research findings, is an important step to integrate evidence into policy.

More specifically, with respect to National public health policy, the results support a review of current eating guidelines as this research shows children make food choices from a collection of concepts that do not align with the current ADGs. In addition, the research supports that an understanding about healthy foods and having healthy foods available is important but it does not necessarily translate into children choosing and eating healthy food (172, 248, 249). More effort is required to offer food that meets children's decision-making criteria. Concerning national curriculum (259), there is an opportunity to revamp the health and physical activity learning area and connect healthy messages taught in class to other areas of the school environment to maintain consistency of messages across the whole school setting. This research shows that children are able to articulate collectively five shared decision-making concepts and the process of exploring children's views on factors that influence food choice incorporated into the national curriculum can result in child participation to strengthen the food environment becoming the norm in all schools.

Alternatively, the idea of using the model to assist with the evaluation of national policy is worth considering. Current nutrition-related policies for offering food to children may benefit from an appraisal in light of the decision-making criteria that children use and other aspects of the model. The appraisal could highlight specific areas from the model that are missing in a policy, or areas that need strengthening in a policy. The model also provides a practical tool to support the translation of formative research to nutrition-related health policy.

At a local level, an implication of the research could be that Education Departments make school nutrition policies mandatory using the model to help guide the policy development. Part of the policy can include a process to consider children's decision-making criteria for making food choices. The concepts in the model developed from the research are broad enough that schools can adapt them for their specific context. The concepts can also inform guidelines that contain ideas how canteens can work with healthy options that align with the ADGs and adjust the healthy foods to make them more desirable for children.

For public health and health promotion, using a gold standard Randomised Control Trial (RCT) is not seen to accommodate the real-life variables that inevitably occur outside of the laboratory (43, 182, 258). As such, the type of research described here is an appropriate way of approaching the research is PAR, rather than the gold standard RCT. This research provides a consistent way of working in schools using research approaches that are appropriate for public health and health promotion research. PAR is an example of an approach suitable for interventions with children in schools (217, 235) and this model could be used to guide such a process. Furthermore, the Discovery Day is a suitable data collection method to access the views of children during school. The Discovery Day also aligns with the appropriate stage of cognitive development. Children at primary school need a physical object to relate to when discussing their thoughts and feelings as they are not able to think in an abstract way at this age (141). This would include using the children's school canteen as a proxy to give them the context they need for exploring their views.

6.7 Summary

In summary, the concepts uncovered in this research have added to the established concepts that support healthy eating behaviours to form a theoretical model. The new knowledge gained from this research adds to known factors that influence children's eating behaviours in the school setting. The model recognises what is currently known (current state of play) and adds new concepts to support movement towards the ideal. This new paradigm can take health promotion in the school setting one-step further and can have an impact on eating behaviours at a broader level. The framework supports the SEM, can guide policy development and is suitable for the cognitive development stage for primary school children. While the theoretical model could be translated across a range of policies, strategies and accreditation systems, it is acknowledged that more research is required to refine the model. Stemming from the results is a recommendation to conduct the research on a larger scale among a range of demographics and food environments to see if similar concepts emerge. Despite being in its infancy, the model is a starting point for policy reform and a new paradigm of incorporating more insight from key stakeholders, the children.

CHAPTER 7 RECOMMENDATIONS, CONCLUSIONS AND POSTSCRIPT

This journey has inspired me to progress this research further as I truly believe we can make a positive difference to children's eating habits, with their help.

Suzie Waddingham

A Participatory Action Research (PAR) approach provides an effective method to explore and understand more about children's decision-making criteria for food choice. Children's own perceptions hold the potential of making healthy food desirable to children. Knowledge was created that adds to existing evidence about food environments in the school setting. Research that translates to practice can achieve positive change. This study integrates what was known with what was discovered in this research to develop a model to translate research into practice. The model has the potential to change how we approach healthy eating programs aimed at children. Such a paradigm shift will use children's own decision-making criteria to create healthy choices.

The previous chapters have presented a literature review, the philosophical underpinnings of the research, the research approach and findings, followed by the discussion in relation to the findings. This concluding chapter will reflect on the significance of the study, whether the study aims were achieved and how it contributed to the body of knowledge. The strengths and limitations will provide a means to evaluate the research. Recommendations, including thoughts on how to strengthen and build on the new knowledge, concluding remarks and a postscript with my professional critique will follow.

7.1 Significance of the research

A healthy diet is integral to achieving a healthy society. Given that most Australians, including children, are not eating in line with the Australian Dietary Guidelines, children who establish healthy eating habits early in life will benefit from these habits into their future. This research is part of the solution to establish healthy eating habits during childhood and bares great significance for the health of our young and future generations.

The identified gap in knowledge was two-fold; how to support children to make better food choices for themselves; and according to children, why do children make the food choices they do. To address the knowledge gap, my research increased the understanding of children's decision-making criteria about food choice. Small-scale interventions are important to build evidence that can extend to larger scale interventions (57), this research can extend into health promotion programs, policy development and further research. Health promotion programs should consider the decision-making criteria discovered from the research. By using children's own criteria, healthy options can become desirable to children within a school healthy food environment and result in a positive impact on eating behaviours.

The project intent was largely exploratory to increase knowledge-base. The school Principal, teachers and a parent on the project team were integrated in the research, learning about factors that influence children's food choice. The school has since engaged in two local government funded programs to support healthy eating and physical activity in the school environment. However, it is unclear how the project influenced this outcome in relation to other factors and interventions.

7.2 The research questions

Two research questions directed this study:

1. Are children able to provide decision-making criteria for their food choice?
2. What influences food choice from a child's perspective?

This study revealed that children are able to provide decision-making criteria for their food choice and articulate what influenced their decisions about choosing food. Information provided by children uncovered theoretical concepts entailing decision-making criteria children use collectively to make choices about what food to eat. Further conceptualisation of known evidence and new knowledge from this research enabled the development of a model to support the translation of research to practice.

Additional information was collected throughout the five action cycles that did not directly answer the key research questions but collectively provided context and depth to the research. It was found that the amount of 'red' food on the menu was higher than recommended, however the menu still contain several 'amber' and 'green' options. Despite having healthy options available, the children still opted for unhealthy options. In addition, when a healthy option was prepared to meet a number of the decision-making criteria that children use for choosing food (to make it more desirable), many more children opted for the desirable healthy choice. Overall, the range of data collected, analysed and conceptualised, supports existing evidence, creates new knowledge and has led to recommendations for future research and practice.

7.3 Strength and limitations

In all research, especially public health, unexpected occurrences can occur in the data collection process, which requires a flexible approach from the research team. While seamless progress is unrealistic in public health research, we can learn from each other by sharing the strengths, limitations and lessons learned to support future research.

7.3.1 Strengths

This research has immediate relevance for creating a novel way for presenting and promoting healthy eating in schools. The process used to obtain data was successful in investigating the views of children about food choices. In particular, the Discovery Day approach proved to be an effective data collection method for obtaining opinions and thoughts from children. Accessing deeper layers of understanding from children has been discussed as a limitation of focus groups and surveys (27, 248, 250). Through a process of conceptualisation theoretical concepts and a model were developed. The model will contribute to new way of creating desirable healthy eating habits with children.

Another strength is the translation process that has been completed. The translation process takes a large body of complex material integrates known concepts with new concepts and condenses the knowledge to a one-page model (43, 258). Having a user-friendly model that as a vehicle to translate research into practice strengthens the research and epitomises a Professional Doctorate.

The data from Action Cycles 3 and 5 was analysed using Conventional Concept Analysis (CCA). A range of criteria known to establish trustworthiness in qualitative research was used to strengthen the research. The criteria used were credibility, transferability, dependability and confirmability (241-243). Credibility (ensuring the data is an adequate representation of participants views) was increased through accessing the data directly from children, collecting data from children in a familiar environment during their usual class time, using multiple and repeated responses to form categories (which, informed the emerging themes and concepts). Collecting data using a variety of means also strengthened credibility. First, PAR builds a reflective process into each action cycle before planning the next cycle. This reflective process resulted in a range of different data collection processes over the course of the five cycles. Second, CCA was performed on data from two discrete cycles collecting the same type of data. Transcribed audio transcribed (verbatim) from two Discovery Days and worksheets from one of the Discovery Days were all used in the analysis. Third, the last step of the analysis was making sense of the data as a whole, across all five action cycles.

Determination of the trustworthiness was maximised by considering the criteria dependability and confirmability. Dependability of the research was strengthened through using a transparent systematic research approach and by incorporating inter-coder verification. Confirmability (ensuring the data are coherently grounded in the findings) was achieved by presenting the research to a range of audiences (through conferences and journals) and obtain feedback to establish if the links between data and findings are clear. Overall, a range of parameters contributed to a robust and scientifically sound research.

Maximising opportunities for critique of the research through a peer-review processes was another strength. The research was peer-reviewed for publication through the submission of papers to three journals and oral presentations at three national conferences. This research has been published in two international journals (Health Education and Appetite) and submitted to an Australian journal (Nutrition and Dietetics). The research was presented at two high quality Australian conferences (Public Health Congress 2015 and Dietitians Association of Australia 2016 - which published abstracts in their Nutrition and Dietetic journal). The research was also presented at a state Dietitians Association of Australia weekend workshop. The researcher made the state finals for the 3MT (Three Minute Thesis) competition in 2016 and was one of two students invited to present at the University of Tasmania Research and Innovations dinner. The research was accepted for presentation via poster or oral for three international conferences, including the European Federations of Associations of Dietitians Conference (2017), the International Conference for Public Health, Food and Nutrition (2017) and the International Congress on Nutrition and Health (2018). The research has sparked interest in the academic arena and there has been considerable opportunity for peer-review to occur. The critique gained from the various scientific audiences, peers and reviewers was used to shape and strengthen the research.

7.3.2 Limitations

Limitations have been identified pertaining to this study. The first relates to the study setting, a suburban Catholic non-government primary school in Southern Tasmania, Australia located in a low socio-economic area. It must be acknowledged that this school environment will have differences to other schools and the results of this study are related directly to the school in which the research took place. However, the findings and the process of collecting data could provide valuable understandings for others who see a resemblance between this study context and their own.

Another limitation was the use of teachers as researchers to collect most of the data. The PAR approach intentionally includes community members as co-researchers; however, there are some nuances in research that can be forgotten with inexperience. Although the researcher provided clear instructions of details to collect, such as precise attendance at each data collection point, some information was lost or not collected. Given the qualitative nature of the study, this was not detrimental to the outcomes.

This study acknowledges that more research into healthy food choices within children in other school environments is required to build on the findings from this study. Moreover, it is important to note that the responsibility for assessment of transferability lies with the reader rather than the researcher (243). This research should be recognised as a unique investigation in healthy food choices in children that may be applicable in similar populations in similar circumstances. As with all PAR studies, there is a limited capacity to generalise results and the research would require repeating in different settings, such as the home environment (235).

7.4 Generated questions and recommendations

One of the indications of useful research is the generation of new knowledge, another is the generation of new questions an extension of ideas and recommendations. This research has delivered on both of these elements. The researcher has already begun disseminating the outcomes, is investigating opportunities to disseminate her findings and has commenced networking with other researchers to share finding and recommendations that have come from this study.

7.4.1 Generated questions

One of the limitations highlighted earlier was the contextual boundaries of the research, due to the qualitative nature and because participants were from a single school with a particular demographic. To extend generalisability of the findings, key questions for future research include: Are the theoretical concepts the same across rural schools, government schools and schools in different regions of Tasmania or across Australia? and Can the theoretical model drive an increase in the purchase of healthy food among primary school children in the school setting?

The school setting is a topical environment that current research programs target for promoting healthy behaviours to children. However, how many programs base their strategies on adult assumptions? Do we really know who chooses the food for lunch orders? Parents or children? Stating that parents choose the lunch orders and the children decide on what they buy over the counter is an assumption. What about lunch boxes, who chooses the food? If parents do make the choice, do children choose to eat the foods in their lunch? Is it possible that the theoretical model created in this research is an effective guide for parents as well? Concerning the canteen, what do children think about each canteen item? Is school canteen food being indirectly endorsing these foods as good choices because the school is offering them?

The interest in healthy eating among children can extend to other related concepts such as dental health and health literacy matters. The research has led to a wide applicability. For example, given the amount of sugary foods purchased by children in the canteen, what are the dental caries levels like in primary schools? Furthermore, how health literate are primary school children? What are opportunities are we missing to address a range of concepts at the same time?

Further to this curiosity, is it possible that children have continuity in their decision-making criteria towards food across different environments? For example, are the theoretical concepts the same in different settings, such as sports settings or the home environment? Ultimately, we want to find a way transform healthy food as a desirable option for children over time. That is, can the theoretical model contribute to establishing healthy eating habits among children? What happens to eating habits at school when there is consistency in healthy messages and desirable healthy food provided throughout the whole school food environment?

The process and learnings through this Doctorate has led to a range of new questions. Given the iterative nature of research, emerging questions are a positive attribute of the research. I intend to search for opportunities to extend the knowledge gained from this research by looking for collaboration with interested academics to continue this insightful investigation.

7.4.2 Recommendations

Recommendation 1 - The research affirms that health workers should ask children directly about their decision-making criteria and use their criteria to make healthy foods desirable to children.

It is crucial that priority is given to allocate resources for further research into the development of our understanding around children's food choice motivations. It is time to strengthen this new paradigm of putting children at the centre of informing strategies that aim to improve their eating behaviour. Children are at a different stage of development than adults and make their choices based on different decision-making criteria, yet adults develop the strategies to improve eating behaviours. Children can assist experts in creating effective and targeted interventions through helping us understand what concepts they use to make a decision about what food they will choose.

Recommendation 2 - Participatory Action Research and Discovery Days are key for conducting research with children

Using PAR in the school setting is the most effective and efficient approach to conduct research with schools, obtain data with children about their views and evoke change. In particular, the Discovery Day was an approach to data collection with children that aligned well with ethical requirements for conducting research with children, primary school children's cognitive stage of development and with PAR itself. This thesis provides robust support for adopting the same approach when attempting to understand the perspectives of children.

Recommendation 3 - Healthy canteens should consist of healthy foods made desirable to children

Canteens should consist of healthy foods made desirable by ensuring the healthy foods incorporate theoretical concepts from the model. This could result in some 'green' foods being classified as 'amber' choices but they are based on healthy foods. Thus, 'green' and 'amber' choices could all be based on healthy food made desirable to children. This is preferable to the current situation where many 'amber' foods are 'greened up' red foods.

The following explanation helps to make this recommendation clearer. To progress from children's current eating behaviours to the ideal (that is, healthy eating is commonplace for children in the school setting), a shift in thinking might be required. Children's decision-making criteria for food choice is different to adults, therefore a compromise to the current healthy eating guides for canteens is called for.

The nutritional quality of food lies on a spectrum of 'red' foods to 'green' foods, with 'amber' foods having elements of good and poor nutrient quality. Within the school setting, an attempt has been made to move towards more 'green' options by taking unhealthy 'red' options and changing the nutrients to improve the quality so it reaches more of an 'amber' classification. The most common nutrients that are adjusted include salt, sugar and fat. These innate flavours provide pleasure, are palatable and primary school children are still strongly driven by such tastes. Currently, many healthy canteens are comprised of 'green' food and 'amber' foods, which are ultimately 'red' foods manipulated to fit the 'amber' category. Many foods in the 'amber' category look like familiar unhealthy options.

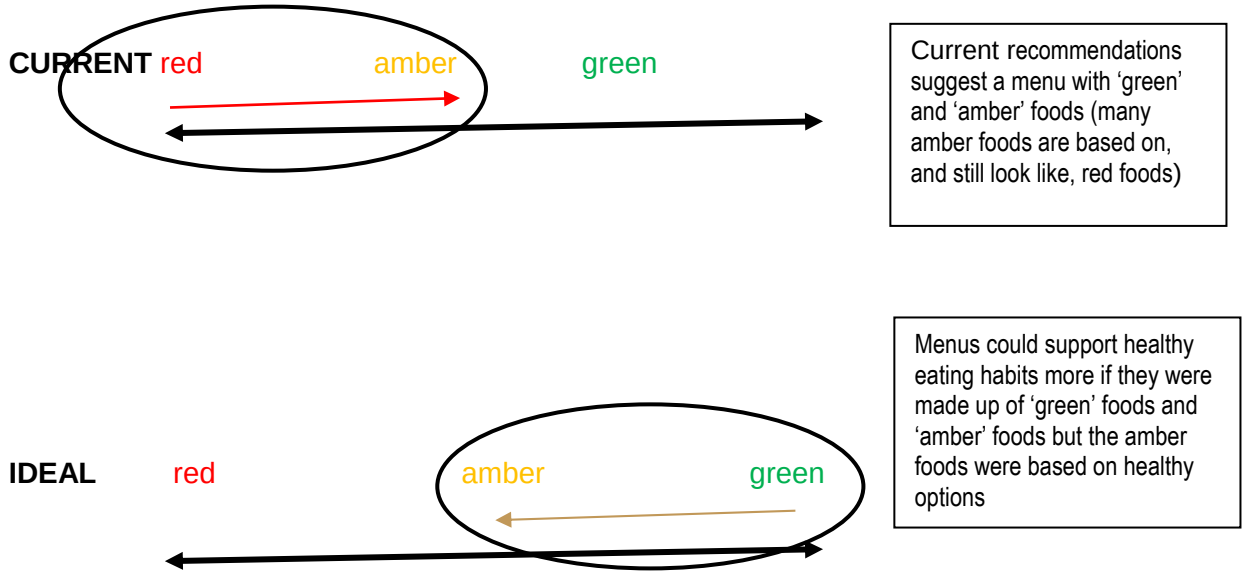


Figure 7.5 The canteen menu should be based on green foods and amber foods that are made from green foods, and incorporate children's decision-making criteria

By offering 'amber' as adapted 'green' food, children will become familiar with the 'green' food. At an evolutionary and biological level, children are still influenced by innate taste as they are seeking high-energy foods to support their growth. Rather than 'greening up' processed and unhealthy food, what if, 'red' food stayed 'red' and green and amber foods were a collection of ultimately green foods but some of them have preferred flavours added to make them amber.

It is recommended that schools work on the green end of the spectrum to combine unprocessed 'green' foods with those innate flavours (which would also become 'amber') to increase the acceptability and familiarity of foods that are naturally nutrient dense but do not fit the criteria children use to choose food. For example, vegetables are predominantly bitter and bitter tastes are innately disliked, yet vegetables are classified as a 'green option'. Rather than start with a 'red' food and attempt to 'green' it up, this research supports the potential of starting with 'green' foods and adjust them with preferred flavours.

This would mean that primary school students, the focus of this research, would be starting with foods recommended for eating daily (based on the ADGs) and mixing them with nutrients that are typically limited in the ADGs. The results could be healthy canteen guidelines that are appropriate for the cognitive and biological development of the primary school age group.

Recommendation 4 - Further research is required to develop and strengthen these ideas.

The first research recommendation is to repeat the study process on a larger scale across school settings with a range of demographics to see if the results are school specific, or if theoretical concepts can be generalised across a primary school setting. In addition, repeat the study with secondary schools to compared decision-making criteria. It could be argued that the project school was not engaged with a health promotion program, thus it is recommended to include schools who are already engaged with state health promotion programs (MWEW, Cool CAP), to see if the results are different in those schools.

This research did not include investigation into connections with the home environment. Future studies should involve research that compares canteen choices between three groups: those who brought lunch and nothing from the canteen, those who bought from the canteen and nothing from home, and those who brought from home and bought from the canteen.

7.5 Conclusion

Poor eating habits are a risk factor for many NCDs and sub-clinical issues globally (8, 11, 12, 14, 260). At a local level, the majority of Australians do not adhere to the Australian Dietary Guidelines. In particular, vegetables and fruit are highly protective against NCDs and are very nutrient dense, yet only two per cent of children aged 5-14 years old eat the recommended serves each day (14). To change the current burden that poor eating habits and NCDs are creating in our health system, a paradigm shift is required. It is undisputed in the literature that healthy eating habits and nutrition are exceptionally important in childhood (5, 14, 16, 24).

Focusing on changing healthy eating habits among children is not a novel idea. However, asking the children how and why they make foods choices offers a new perspective, which can be used to drive policies in this area. This project sets up the foundations to continue important research into the area of childhood nutrition by accessing the key change makers, the children themselves.

This study has found that children are key informants because they were able to articulate their decision-making criteria for food choice. Their criteria informed the development of a practical model that could be used to guide public health interventions and nutrition-related policy in the school setting. This research indicates that we have not paid enough attention to children's perceptions when designing programs to improve their eating habits and has the potential to foster professional debate. It is known that for a paradigm shift to occur for healthy eating in schools, health professionals, school communities and government need to consistently convey the same healthy food messages and listen to the children as the most important key stakeholders.

In conclusion, children are key informants about concepts influencing their food choices, which led to a model that translates the research outcomes into a practical tool for supporting the promotion of healthy eating in schools that are desirable to children. The model developed represents the complexities of promoting healthy eating to schoolchildren and can serve as a consistent guide for all sectors that address healthy eating in schools.

7.6 Postscript – a professional critique of the research

After 20 years in the profession, completing a Master's in Public Health and being able to focus intimately on childhood nutrition in school setting, this Professional Doctorate has generated new thoughts and questions for me. Research is a fascinating process whereby the more you know, the more you realise you do not know and want to know more; and so the cycle continues. I have included two pertinent points that took my mind on a tangent, that are not directly relate to the research, but they relate to me as a professional.

School canteen associations and healthy canteen guidelines were first developed in Tasmanian, and other Australian states, in the 1990's and at a national level in 2010, when the first National Healthy Schools guidelines were released (244). Classifying foods as 'green', 'amber' or 'red' intends to inform school staff which foods are healthy, unhealthy or have elements of both. All canteen guidelines suggest that canteens reduce or eliminate 'red' options and have mostly 'green' with some 'amber' options. What has happened over the years is that the food industry, who understand children's criteria for making food choice (148), began to adjust the ingredients in their 'red' options so they can be classified as 'amber'. At an ingredient level, these foods may meet the requirements but at a food level, the result is confusing to children who are concrete thinkers in primary school. For example, even as an adult it is impossible to tell the difference between a 'red' chicken nugget and an 'amber' chicken nugget. To a child, who are concrete thinkers at this age, any chicken nugget must be an acceptable choice if they are deemed as good choices at school. While evidence indicate that the amount of 'red' foods in Australian canteens are decreasing, what is happening with the 'amber' foods? Furthermore, if 'amber' foods are adjusted 'red' foods but look the same and children see food offered at the canteen as an indirect endorsement, how is this going to support in improved eating behaviour outside of the school setting and into the future.

Another observation that was not a core element of the research but noticed was the idea of instant gratification. Theoretical concepts that emerged from the research all relate to instant gratification, rather than long-term consequences, which fits with the concrete thinking of a primary school age group. It is possible that the same concepts could translate to adolescents as well and to influence food choice, we need to work with the criteria that provide the required instant gratification in all children under eighteen.

Overall, completing a Professional Doctorate has deeply enhanced my understanding of productive research that can be translated into practice. I have a solid understanding of the level of detail required to produce scientifically acceptable evidence and the iterations required to translate complex information into a simple story. Finally, this journey has inspired me to progress this research further as I truly believe we can make a positive difference to our children's eating habits in our current food landscape.

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APPENDICES

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DRAFT manuscript

Making healthy food desirable to children using their decision-making criteria; a participatory action research study

Abstract

In Australia, children are not eating according to the Australian Dietary Guidelines despite numerous public health initiatives. Literature regarding children's views about what influences their food choice is limited, representing a gap in knowledge about children's potential role in improving healthy eating. The study aim was to investigate factors that influence food choices in a primary school setting, described by children. Participatory Action Research was used, completing five action cycles with a convenience sample of children in a non-government school in Tasmania (grade two - six). Data was collected through observation, filming and documentation by researchers using; an open class discussion, a day in the canteen, a specified meal for the day and two Discovery Days (children worked in groups to design a healthy menu). Qualitative data was analysed using a conventional content analysis to establish common concepts that represented factors that influence children's food choice. The concepts (pleasure, texture, social acceptability, versatility and eating context) were used to develop an innovative model that can guide canteen menus to create healthy food that is desirable to children. This research argues that we have not paid enough attention to children's perceptions when designing programs to improve their eating habits and has the potential to foster professional debate. In conclusion, children are key informants about concepts influencing their food choices, which led to a model that translates the research outcomes into a practical tool for supporting the promotion of healthy eating in schools.

Introduction

A healthy society has personal, social and economic benefits to people, their family and communities as a whole (1-4). A key determinant of health is eating a healthy diet in a consistent manner (2,5). The influence of good nutrition and healthy eating patterns as a protective factor against many Non-Communicable Diseases (NCDs) is recognised globally

(6). Most Australian adults do not eat a healthy diet (5,7,8). In particular, less than two per cent of Australian's consume daily serves of fruit and vegetables, which are key protective food groups, as recommended by the Australian Dietary Guidelines (ADGs)(7,8).

It is widely acknowledged by many, including health professionals, teachers, and parents, that a need to improve healthy eating amongst children exists (6,8,9). A healthy diet in young children is essential to optimise their growth, cognitive development and reduce their risk of developing a non-communicable disease (NCD), including excess weight, throughout their lifespan (6,8-10). Healthy eating habits established early in life are more likely to persist into adulthood (11-13). Australian children are also not eating in accordance with the ADGs (7,8,11,14). For example, the intake of fruit and vegetable serves are below the national recommendations (7,8). Inversely, the intake of total energy and 'sometimes' foods exceed the ADGs (15,16). Improving healthy eating among all children is a major public health issue that requires immediate attention.

While a large body of literature about childhood nutrition exists, studies that seek to understand the views of children are limited (17,18). The school food environment has an important, yet moderate, sway over children's food choices (19-22) and school canteen reform contributes to a healthy food environment (23,24). Research that endeavour to change school food environments has primarily been based on adult's views about what will result in improved eating behaviours (18,25). Parents assume children won't eat healthy foods if it was offered (15,23,25) but children are not asked why they did not eat certain foods. Banning or forbidding food is not the answer as it does not foster the formation of healthy eating habits in the long-term (26-29). There is evidence that foods labelled as forbidden can create problems with eating, once a food becomes forbidden interest in that food increases (28,29). In addition, excessive control over children's food choices has been shown to negatively affect the development of a healthy diet in the long-term (26,27).

Repeated exposure is central to the acceptance, liking and intake of foods (28,30). Repeated exposure can be achieved through consistent access to healthy choices in the

school food environment. Consistency is also required across the whole school including messages taught in class and any offering of food, in the classroom or canteen (17,19,22). Offering mostly unhealthy foods in the canteen introduces inconsistencies in healthy messages targeted at students and can be viewed as an indirect endorsement for that type of food. This speaks to children as an indirect message to say food offered in the canteen must be an acceptable option (17).

One way to achieve consistency and allegiance is through nutrition policies within the school setting and the transfer of policies into practice (31-34). Policies can shape opportunities for people to make healthier choices (35-38). Policies in the school setting have been recognised as a critical component to support healthy school food environments (39-41). Established literature has shown the importance of implementing and evaluating evidence-based nutrition policies within the school setting (31-34,39,42,43). Translating research into practice requires simplification and better communication of the evidence to make it easier for non-academics to decipher research outcomes (37,44). This can be achieved by translating the outcomes into practical tools (44), such as a model that can guide practitioners working with communities and support the development of policies. Summarising the findings into a simple model that highlights the main research concepts makes it easier to incorporate the concepts into health promotion planning, policy development and further research in the area.

In summary, despite many evidence-based guidelines and health promoting programs across the world, children are still, on average, not eating a healthy diet (6-8,45). A healthy food environment, supported by a school nutrition policy and including consistency of messages and access to healthy options, is an essential platform for healthy eating behaviours in the school setting (17,19-21,28). There are few studies that have sought views of children directly to increase an understanding or to develop strategies to change eating behaviours (18,25,46).

This project sought to engage with children from a primary school in Tasmania to investigate if they were able to articulate their decision-making criteria, and influences on their food

choice. It is plausible that the design of health promotion programs targeted at children thus far has not given enough regard to the decision-making criteria of children, as described by the children themselves rather than through the lens of an adult. The results from this study are then synthesised and used to develop a one-page model that can support the development of school policies, health promotion interventions and further research in the school setting.

Methods

A Participatory Action Research (PAR) approach was used in this study to start filling the gap in the knowledge about children's direct views. The aim was to engage with primary school children and ask about their decision-making criteria when making food choices and discover a method for effectively collecting such data. The PAR approach allows the opportunity to work with teachers who can guide the data collection process with children. This study moved through five action cycles and discovered a process that maximised the data obtained from the children in a non-invasive environment. Children experienced a usual class activity with a visitor asking questions and videoing the day.

In this research, the children (students) were key participants in the generation of knowledge about their food choice. The staff and parents involved in the study provided input into planning, implementing, observing and reflecting on the findings of each cycle. The researcher facilitated the process, provided technical input, analysed the data and compiled the report. The project team members were just as involved with the development of solutions and the flow of action cycles as the researcher was. Collaboration and participation were present across the action cycles, which follows a classic PAR process.

Definition of terms

This paper will use classify food served in the canteen using the terms from The National Healthy School Canteen guidelines. Foods are classified as ‘green’ (healthy choices), ‘amber’ (some healthy and unhealthy elements to the food) and ‘red’ (unhealthy choices) (47).

Characteristics of study population

The convenience sample included students enrolled in a catholic non-government primary school, southern Tasmania, in suburb with a SEIFA ranking of two for disadvantage (48). The SEIFA ranking intends to rank areas in Australia according to relative socio-economic advantage and disadvantage (48). The five-yearly Australian Census information was used to calculate the indexes (48). Measures of disadvantage include low education levels, unskilled occupation, low income and high unemployment (48). Given that health status is positively associated with education and income (5), the index provides context to the study school. In this case, the school is an area with low education levels and high unemployment, such demographics typically have lower levels of health attainment also (5,37).

The convenience sample used in this study included students enrolled in a catholic non-government primary school in Southern Tasmania. Children in grades two to six participated (except in action cycle two, which included students from Kindergarten to grade six who bought from the canteen that day), representing children aged 7-12 years old.

Ethics

This study has received a full ethics approval through the University of Tasmania, Social Science Human Research Ethics committee (HREC), approval number H0012935.

Design

The project had intentions to understand children's food choices from their perspective, change the food environment within the school in accordance with children's motivations and see if this changed their eating behaviour. The progression of the action was expected to be linear with one action cycle leading to the next (Figure 1). Due to the nature of PAR, the approach evolved with each cycle and the led to action cycles that were a matrix of interconnected cycles (Figure 2). At the onset of the project, it was unknown how many cycles would make up the research journey. The details of each action cycle are described in the following sections.

Action Cycle 1 (Open discussion in class)

The first round of data collection was obtained by the teachers through open questioning to a class of students using purpose designed semi-structured questions provided by the researcher (see Table 1). Details of this action cycle are published in Waddingham et al. (49)

Action Cycle 2 (A day in the canteen)

Upon reflection of the results that came from Action Cycle 1, it was agreed that an action cycle was required to determine what foods were offered to children from the canteen and what food were children actually choosing from the canteen. The preparation of menu items plus the food items actually purchased both for lunch orders and over the counter was recorded. This information was collated and sent to the researcher for analysis. Details of this action cycle are published in Waddingham et al. (49)

Action Cycle 3 (Discovery Day one)

Action Cycle 3 evolved from reflection of Action Cycle 1 and 2. The data collection method used was called a Discovery Day. The concept and design of the Discovery Day was orchestrated by the teachers on the project team. During the Discovery Day, children worked in groups to develop a healthy canteen menu and described why they put their chosen food

on the menu. The day was co-ordinated by the teachers who provided minimal assistance or input into the outcomes.

Children from grades two - six (n=100) worked autonomously in groups (made up of a mix of grades) for a full day (with recess and lunch breaks as usual) and came up with the menus on their own. A project team member filmed groups during the day and the presentations given at the end of the day. These video clips were viewed twice at the school by the researcher before the audio was transcribed verbatim and a conventional content analysis completed. Details of this action cycle are published in Waddingham et al. (50)

Action Cycle 4 (Spaghetti Bolognaise for lunch)

A small pilot was conducted to test the feasibility of providing a lunch meal as an option that meet the student criteria for food choice and the ADGs. The researcher provided guidelines to the school about suitable ingredients and cooking methods that would a create spaghetti bolognaise meal, which was classified as a ‘green’ option according to the Guidelines for Healthy Food and Drink Supplied in School Canteens (51). The meal was only available as a lunch order and not over the counter during recess or lunch.

A small number of parents prepared the meal onsite the same morning it was offered. The parent from the project team tallied up the number of order’s taken for the spaghetti bolognaise. An anecdotal gauge of consumption was through observations of rubbish bins when bowls were discarded. All recorded information was provided to the researcher.

Action Cycle 5 (Discovery Day two)

The project team agreed data sufficiency was not reached after Action Cycle 2, 3 and 4, which led to Action Cycle 5. Action Cycle 5 was a repeat of the Discovery Day in Action Cycle 3, with the intention was to increase the focus on ‘why’ children made the choices rather than what they chose. Details of this action cycle are published in Waddingham et al. (50)

Results

Action Cycle 1 (open-class discussion)

Two teachers facilitated open-class discussions during class time with grades three, four, five and six. Group one included of 26 children and group two included of 54 children. The children were sitting in front of the teacher while answering the open questions and the teacher recorded the answers, which were later sent to the researcher for collation.

Most children asked (69 out of 80 children) purchased food from the canteen in the previous week. Of the six most popular food types reported, four were classified as ‘red’, one was ‘amber’ and one was ‘green’ (Table 1). Both groups of children (n=80) were separately asked what foods they would *like to be available* in the canteen. The results were combined and the most popular foods included: confectionary; ice-cream and icy-poles; nachos and tacos; pasta dishes; rolls and wraps; and processed chicken.

When asked to describe healthy foods, a range of responses were offered by the children, including; vegetables and fruit, wholegrain food, food high in vitamins, natural and unprocessed food without preservatives, food that is good for your body to grow and keep fit. The results revealed that children did display an understanding of healthy food.

After the class discussion about healthy and unhealthy foods, the teacher asked each group to provide reasons why they chose unhealthy foods as a preference (confectionary, crisps, chicken nuggets, hot chips) and recorded the reasons provided. The reasons included taste, flavour, quick, easy, cheap, available, filling and hot food warms you up.

Action Cycle 2 (observation of the canteen)

During this cycle, data was collected about foods offered, prepared and purchased from the canteen in a randomly selected school day. Any child who bought food from the canteen on this day was included in this action cycle. Food was categorised using the Tasmanian

School Canteen Association Product List, which was based on the Guidelines for Healthy Food and Drinks Supplied in School Canteens (47,52). Accordingly, foods were categorised into three groups; ‘green’ (healthy), ‘amber’ (contains both healthy and unhealthy elements), and ‘red’ (unhealthy). The only exception was the categorisation of pies, sausage rolls and chicken nuggets, which will be classified as ‘red’ food for this study.

The canteen menu contained 43 food and drink options and approximately two thirds (60 per cent) of the options were ‘green’ (30 per cent) and ‘amber’ (30 per cent), while 40 per cent were categorised as ‘red’ choices.

Nineteen percent of foods offered were prepared onsite, including salad rolls/wraps, toasted sandwiches and burgers using pre-prepared ingredients (e.g. processed chicken used for the wraps). The remaining foods offered on the menu were commercially prepared, packaged and ready to serve (or heat and serve).

Overall, the majority of the food items that were purchased from the canteen were ‘red’ foods (92 per cent). The proportion of ‘amber’ and ‘green’ foods purchased was lower, 3 per cent and 5 per cent respectively (Table 2), even though ‘amber’ and ‘green’ foods were available on the menu. The most popular foods purchased from the canteen were classified as ‘red’ foods (Table 2).

Action Cycle 3 (Discovery Day one)

During the Discovery Day, seventeen groups (with five to six children in each group) were filmed in 78 short segments and viewed by the researcher. Videos less than 10 seconds were excluded from this research. Fifty-two segments were observed and reviewed, with 48 videos remaining that were audible and relevant. The audio from each of the 48 videos was transcribed verbatim for analysis. Analysis of the data from Action Cycle 3 was based on the videos and transcribed audio from the videos. In line with Hsieh and Shannon (53), the researcher read the transcripts in full and coded them line by line, codes with a similar meaning were developed into categories and discovering the links between the categories

aided in developing themes. To gain multiple perspectives on the analysis, two co-researchers helped to inform the themes. At this stage of the research four themes emerged; knowledge, liking, consensus and uncomplicated drivers. Details of the themes can be found in Waddingham et al. (50)

Action Cycle 4 (pilot a lunch option)

Action Cycle 4 was conducted with schoolchildren from grades two to six (n=235) who were given the option to order from the canteen menu as well as spaghetti bolognaise, a healthy food item. The spaghetti bolognaise was based on a healthy recipe provided by the researcher, incorporating children's criteria.

There were 108 serves of spaghetti bolognaise ordered for lunch, which equates to a 43 per cent uptake of a healthy option that met criteria that children expressed as being important. A project team member checked the bins intermittently during lunch to observe waste and reported that most of the meals were eaten with minimal waste.

Action Cycle 4 showed using children's rationale can positively influence their food choice. This was demonstrated by the great uptake of the spaghetti bolognaise choice and the minimal waste. At the conclusion of Action Cycle 4, the project team decided not to repeat another cycle as at this stage it had become clear that children's food choices could be influenced by using their own criteria.

Action Cycle 5 (Discovery Day two)

On the second Discovery Day, children had to develop a menu containing five foods and three drinks and had to document why they chose those items. No emphasis was placed on the menu being healthy as the focus was on understanding the rationale that children use for any food choice. There were 23 groups, with four to five students in each group and over the course of the day 27 video clips were taken. From the 27 video clips, the audio from 24 videos was transcribed verbatim for analysis.

Analysis of the data from Action Cycle 5 was based on the videos, transcribed audio from the videos and worksheets. Like Action Cycle 3, Conventional CA was in line with Hsieh and

Shannon (53). The researcher read the transcripts in full and coded them line by line, codes with a similar meaning were developed into categories and discovering the links between the categories aided in developing the themes. To gain multiple perspectives on the analysis, one co-researchers helped to inform the themes. Six themes emerged from this Discovery Day; knowledge, pleasure, versatility, texture, eating context, social acceptability. More details about these results ca be found in Waddingham et al. (50)

Putting it all together

The study followed a PAR trajectory, the exact direction of the project was unknown beyond Action Cycle 1. Reflection between each cycle is key to the PAR process and presenting each action cycle in sequential order highlights the link between reflection and planning for the next cycle. Although the preceding sections have presented findings from individual cycles, in reality, and within the realms of action research, the action cycles occurred in an interconnected matrix (Figure 2).

The final part of the analysis is to interpret the findings as a whole; what commonalities exist to form theoretical concepts that represent the full data collection. When results were viewed across cycles, one theoretical concept emerged that did not drive food choice (knowledge) and five theoretical concepts emerged that did drive food choice (Figure 3). This section allows for a transition into the discussion.

The first step in the final part of the analysis was to integrate themes that emerged from the conventional content analysis in Action Cycle 3 and 5. Two of the themes, versatility and texture, were not strong in the first Discovery Day (Action Cycle 3) but strong in the second Discovery Day (Action Cycle 5), which had more thorough data collection. Figure 3 shows how the themes from Action Cycle 3 and 5 fed into the creation of the theoretical concepts.

Action Cycle 1, 2 and 4 were a mix of qualitative and quantitative data. The analysis was a mix of descriptive statistics and direct reporting from open-ended questions. Key data represented themes that had similarities with the emerging themes from the conventional CA and shown in Figure 3.

Together, there is a thread of similarities across the matrix of action cycles. When these themes are integrated, theoretical concepts emerge that are representative of the action research as a whole (Figure 5.11). Knowledge is a key concept that does not appear to influence children in their decision-making. The other five concepts (popularity, pleasure, eating context, versatility and texture) influence children's food decisions. Each concept was not expressed in isolation; it appears that the concepts collectively influence children's food choice. Each theoretical concept is reiterated here before moving onto the discussion.

1. Knowledge

This concept represents the notion that children demonstrated an understanding of what food is healthy (*"because it is a mixture of fruits and healthy"*) and what is unhealthy (*"it was all [fast food1] and [fast food2] and food like that…but we knew the teachers would be looking for healthy stuff"*). Some of their perceptions where unique (*"like donuts to keep your heart going"*). Despite this understanding about healthy foods, unhealthy options were still predominantly chosen.

Most children related healthy options as fruit, salad, water, milk and spaghetti bolognaise/lasagne. This was evident through quotes such as *"…we chose Caesar salad because we thought we should have some healthy stuff", "water and fruit make you healthy"* and *"milk because it is good for you and it's dairy".* At other times, children's knowledge about what constitutes healthy foods was limited (*"…Like doughnuts to keep your heart going").*

It became clear that knowledge did not translate to making healthy choices. Other research has found that in this age group, knowledge about what healthy foods are and why healthy foods are important for the body does not influence children to choose those foods (22,54,55).

2. Popularity

The concept of popularity evolved from two emerging categories; assumed popularity and a voting system. Some children based their decisions on assumptions about what they thought their fellow students would or would not like (*“hot chips because they are popular and everyone likes it”, “because they’re yummy and everyone likes them”* and *“Because they’re kids’ favourite things”).* Within popularity the groups appeared willing to compromise depending on what they thought others would like. Within the other category a voting system, reflected an effort to cooperate or ‘go with the flow’ (*“we had a vote on what foods we like”, “…because it had the most tally’s”*).

3. Pleasure

The concept of pleasure started to emerge in Action Cycle 1 with codes such as *“it tastes good”* and *“once you’ve had a taste, you want more”.* During the two Discovery Days, many groups responded with descriptions such as “*it’s tasty”, “nice”, “I like the flavour”*. ‘Pleasure’ emerged as the name of the concept during Discovery Day two (Action Cycle 5) after realising it was a common descriptor across a range of expressions (such as taste, flavour, food being ‘nice’ or ‘liked’). The concept around pleasure incorporates the following categories; satisfaction (*“Because it tastes really nice”, “healthy but delicious”* and *“tasty, the cheese…makes it delicious”)*, specific taste preferences (*“chocolate is sweet and tasty”, “I like salty things”)* and descriptors about liking the food in combination with taste motivations (*“Choc fudge – like because it’s chocolate, choc is sweet and tasty”* and *“Popcorn, because it's nice and buttery”*).

4. Eating context

Children expressed aspects of food that did not fit with other concepts to describe their own needs and logic. On both Discovery Days children expressed wanted to have hot food on cold days (*“hot chips because people want on cold days”* and *“ hot food warms you up”*) and cold food on hot days (*“it’s cold, it cools you down on a hot day…”* and *“we chose slushies*

because people might want them on hot days…same for juice). Factors like 'fun' (*"you always get brain freeze and it's really fun"),* 'shape' (*Pancakes – "because I like them, the shape")* and an emotional connection (Gummy bears – *"because they're really cute")* were also mentioned as being important components for these children in making a food selection.

5. Versatility

The concept of versatility emerged initially from Action Cycle 1, Table 5.3 (*"quick and easy"* and *"easy to make"*). Versatility was an important motivator regarding choice of certain foods in Action cycle 3 and 5. It was related to ease of preparing food (*"and it's easy to make as well"* and *"because it is easy to make"*) and eating food (*"it is also something that is easy to eat"* and *"they're like a mini quick thing"*). Children also described a liking of food when there was a choice of toppings or flavours available (*"And it comes with a lot of toppings you can choose from"* and *"because you can fill it with anything you want"*), such as pizza and nachos. Finally, children expressed they preferred to have a choice, described as: *"And it comes with a lot of toppings you can choose from".*

6. Texture

The physical properties of a food were important considerations for children when selecting foods (spaghetti bolognaise – *"I like all the different textures and flavours…")*. If groups said they liked a food, the person filming the Discovery Day would probe with more questions to uncover what characteristic of the food the children liked. Children offered a further layer of explanation and on many occasions related to texture. For example, crispiness (bacon – *"…It's crispy and greasy,"* Fish and chips – *"I like eating the crispy parts")*, juiciness (fruit salad – *"the juice in the fruit"*, Grapes – " *most of all, they are juicy")*, fizz (Coke – "*because it's fizzy",*) and food that melted in the mouth (chocolate – *"because it melts in your mouth"* and pizza - *"I really like the melted cheese"*). These examples provide a guide to the type of texture that could be incorporated with healthy options to match some of the features of food that children find appealing.

Discussion

The primary aim of this research was to discover if children themselves can articulate factors that influence their food choice and if there were shared decision-making criteria that primary children use for choosing food. This discovery has led to a collective understanding of concepts that primary school children consider when making food choices. The results from this study concur with international studies that indicate children should be key informants regarding what motivates their food choice (25,56,57). The research resulted in a model, which is presented first (Figure 4).

Translating research into practice is fundamental for improving health status (37,44). Simplification and better communication of the evidence will make it easier for non-academics to decipher research outcomes (44). This can be achieved by translating the outcomes into practical tools (44), such as a model that can guide practitioners working with communities. Summarising the findings into a simple model that highlights the main research concepts makes it easier to incorporate the concepts into health promotion planning, policy development and further research in the area.

The model developed from this research emphasises that health promotion interventions require consideration of the individual embedded in their environment. The bottom section of the framework (Figure 4) summarises established concepts from the literature, which recognise the role of environments as supported by many health promotion models and theories, such as Ottawa charter (58) and the Socio Ecological Model (59).

The top section of Figure 4 shows that this model has embedded key stakeholders, the children, within their environment by connecting children's decision-making criteria with the food available within the school food environment. While the results of qualitative research are not generalisable, a cohesive and shared narrative emerged to inform the results of this research. This shared understanding led to the model. Theoretically, the model will support the change of behaviours within a broader environmental context and help to improve the outcomes of healthy eating programs in schools.

Theoretical models can assist planning for healthy public policy (60). There has been support for the development of healthy public policy globally since Ottawa charter (58) and more recently the Helsinki declaration on health in all policies and the Shanghai declaration (37,38,61). Policies can shape opportunities for people to make healthier choices (35,36). The model developed from this research provides an opportunity to guide policy across states and territories where various strategies are implemented within the school to promote healthy eating. Most importantly, the model can be used as a checkpoint to ensure all concepts are considered collectively before embarking on a health promotion initiative in schools. When a model can translate across a range of different state and territory school-based programs, such that there is one model used nationally, the consistency and strength of action is increased (60).

Policies that influence food and nutrition are vital (37). Although policy formation is presented as a linear process, it has been acknowledged that in reality, policy formation and implementation is an iterative process driven by values and dependent on the social environment (36,37). It has been recognised that policy is not always driven by research, evidence or the best possible approach (36). Policy makers use a range of information but academic research is not often one of them (44). Improving the communication of the evidence to policy makers by translating research outcomes into practical tools can improve the potential of evidence being translated to policy (44). This must be done in a way that it incorporates the views and experiences of the community (44). Developing a model, which summarises the main research findings, is an important step to integrate evidence into policy.

More specifically, with respect to National public health policy, the results support a review of current eating guidelines as this research shows children make food choices from a collection of concepts that do not align with the current ADGs. In addition, the research supports that an understanding about healthy foods and having healthy foods available is important but it does not necessarily translate into children choosing and eating healthy food (62-64). More effort is required to offer food that meets children’s decision-making criteria. Concerning national curriculum (65), there is an opportunity to revamp the health and physical activity learning area and connect healthy messages taught in class to other areas

of the school environment to maintain consistency of messages in the whole school setting. This research shows that children are able to articulate collectively five shared decision-making concepts and the process of exploring children's views on factors that influence food choice incorporated into the national curriculum can result in child participation to strengthen the food environment becoming the norm in all schools.

Alternatively, the idea of using the model to assist with the evaluation of national policy is worth considering. Current nutrition-related policies for offering food to children may benefit from an appraisal in light of the decision-making criteria that children use and other aspects of the model. The appraisal could highlight specific areas from the model that are missing in a policy, or areas that need strengthening in a policy. The model also provides a practical tool to support the translation of formative research to nutrition-related health policy.

At a local level, an implication of the research could be that Education Departments make school nutrition policies mandatory using the model to help guide the policy development. Part of the policy can include a process to consider children's decision-making criteria for making food choices. The concepts in the model developed from the research are broad enough that schools can adapt them for their specific context. The concepts can also inform guidelines that contain ideas how canteens can work with healthy options that align with the ADGs and adjust the healthy foods to make them more desirable for children.

For public health and health promotion, using a gold standard Randomised Control Trial (RCT) is not seen to accommodate the real-life variables that inevitably occur outside of the laboratory (36,37,44). For the type of research described here, an appropriate way of approaching the research is PAR, rather than the gold standard RCT. This research provides a consistent way of working in schools using research approaches that are appropriate for public health and health promotion research. PAR is an example of an approach suitable for interventions with children in schools (66,67) and this model could be used to guide such a process. Furthermore, the Discovery Day is a suitable data collection method to access the views of children during school. The Discovery Day also aligns with the appropriate stage of cognitive development. Children at primary school need a physical object to relate to when discussing their thoughts and feelings as they are not able to think in

an abstract way at this age (68). This would include using the children's school canteen as a proxy to give them the context they need for exploring their views.

This research has immediate relevance for creating a novel way for presenting and promoting healthy eating in schools. The process used to obtain data was successful in investigating the views of children about food choices. In particular, the Discovery Day approach proved to be an effective data collection method for obtaining opinions and thoughts from children. Accessing deeper layers of understanding from children has been discussed as a limitation of focus groups and surveys (63,69,70). Through a process of conceptualisation theoretical concepts and a model were developed. The model will contribute to new way of creating desirable healthy eating habits with children.

This study acknowledges that more research into healthy food choices within children in other school environments is required to build on the findings from this study. Moreover, it is important to note that the responsibility for assessment of transferability lies with the reader rather than the researcher (71). This research should be recognised as a unique investigation in healthy food choices in children that may be applicable in similar populations in similar circumstances. As with all PAR studies, there is a limited capacity to generalise results and the research would require repeating in different settings, such as the home environment (66).

In addition, it must be acknowledged that this school environment will have differences to other schools and the results of this study are related directly to the school in which the research took place. However, the findings and the process of collecting data could provide valuable understandings for others who see a resemblance between this study context and their own.

Conclusions

A healthy diet is integral to achieving a healthy society. Given that most Australians, including children, are not eating in line with the Australian Dietary Guidelines, children who establish healthy eating habits early in life will benefit from these habits into their future. This research is part of the solution to establish healthy eating habits during childhood and bares great significance for the health of our young and future generations.

The identified gap in knowledge was two-fold; how to support children to make better food choices for themselves; and according to children, why do children make the food choices they do. To address the knowledge gap, this research increased the understanding of children's decision-making criteria about food choice. Small-scale interventions are important to build evidence that can extend to larger scale interventions (72), this research can extend into health promotion programs, policy development and further research. Health promotion programs should consider the decision-making criteria discovered from the research. By using children's own criteria, healthy options can become desirable to children within a school healthy food environment and result in a positive impact on eating behaviours.

This study integrates what was known with what was discovered in this research to develop a model to translate research into practice. The model has the potential to change how we approach healthy eating programs aimed at children. Such a paradigm shift will use children's own decision-making criteria to create healthy choices.

Summary

Poor eating habits are a risk factor for many NCDs and sub-clinical issues globally (1,5,73-75). At a local level, the majority of Australians do not adhere to the Australian Dietary Guidelines. In particular, vegetables and fruit are highly protective against NCDs and are very nutrient dense, yet only two per cent of children aged 5-14 years old eat the recommended serves each day (5). To change the current burden that poor eating habits and NCDs are creating in our health system, a paradigm shift is required. It is undisputed in the literature that healthy eating habits and nutrition are exceptionally important in childhood

(5,8,76,77). Focusing on changing healthy eating habits among children is not a novel idea. However, asking the children how and why they make foods choices offers a new perspective, which can be used to drive policies in this area. This project sets up the foundations to continue important research into the area of childhood nutrition by accessing the key change makers, the children themselves.

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Figures

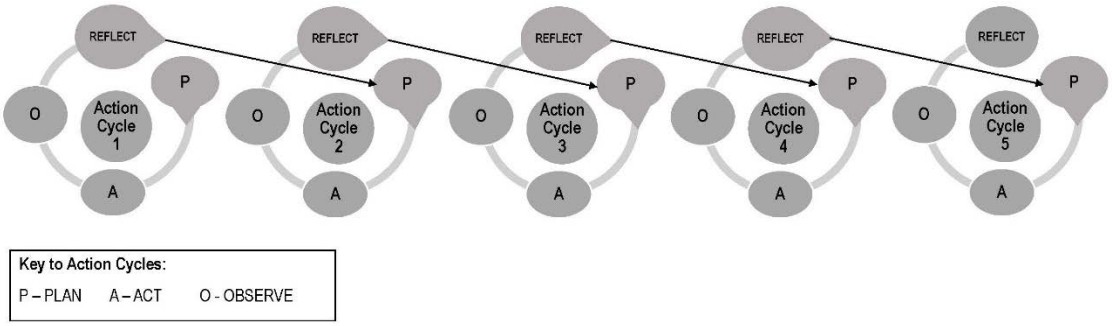

Figure 1 The five action cycles completed in this study were anticipated to be linear.

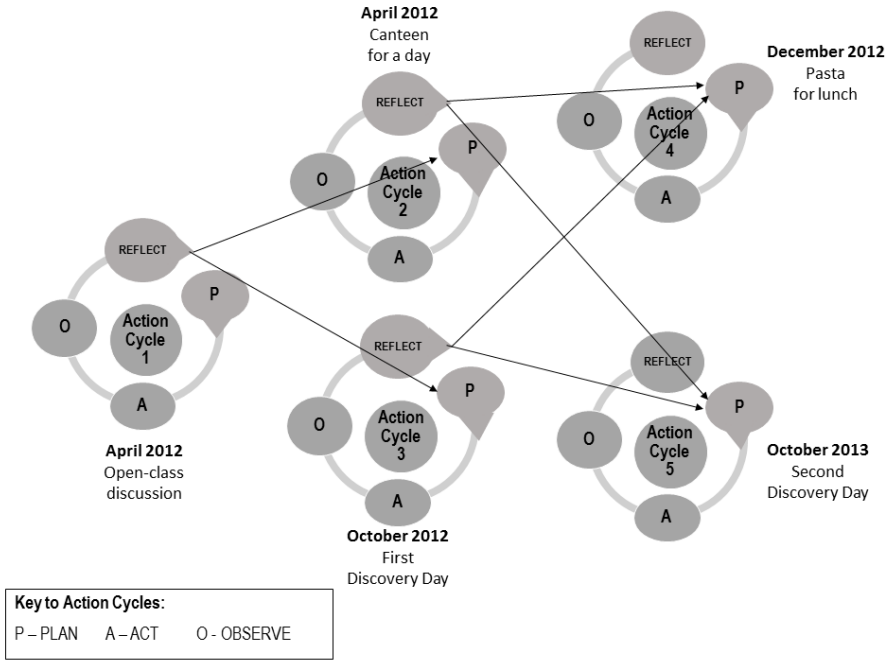

Figure 2 A conceptual map of the five action cycles

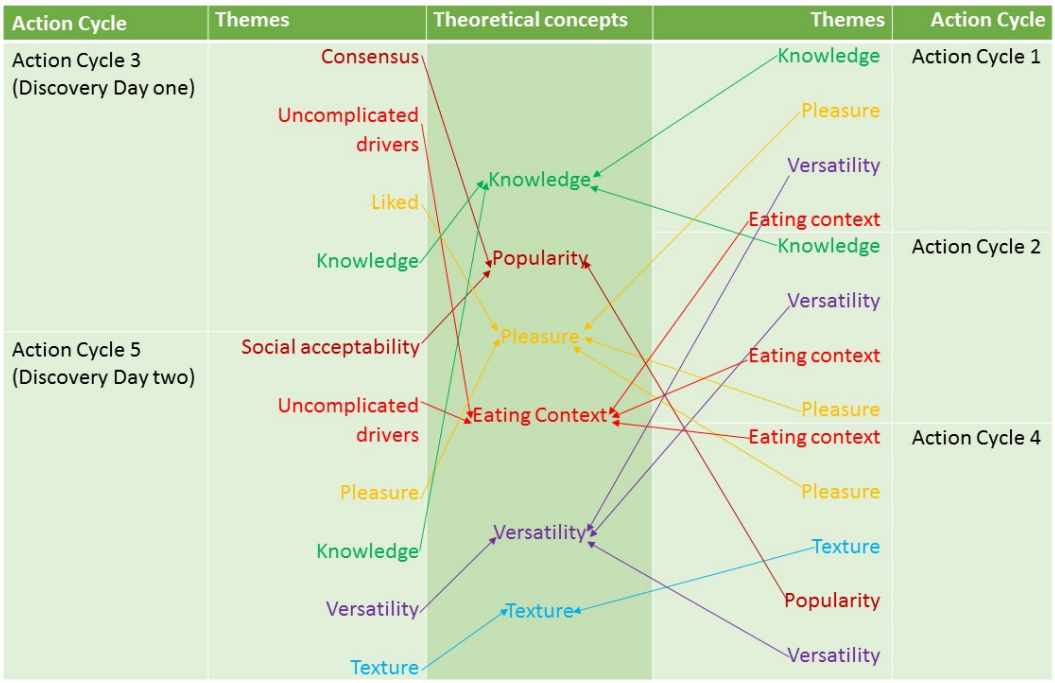

Figure 3 A summary table showing the integration of themes across all five action cycles to reach theoretical concepts.

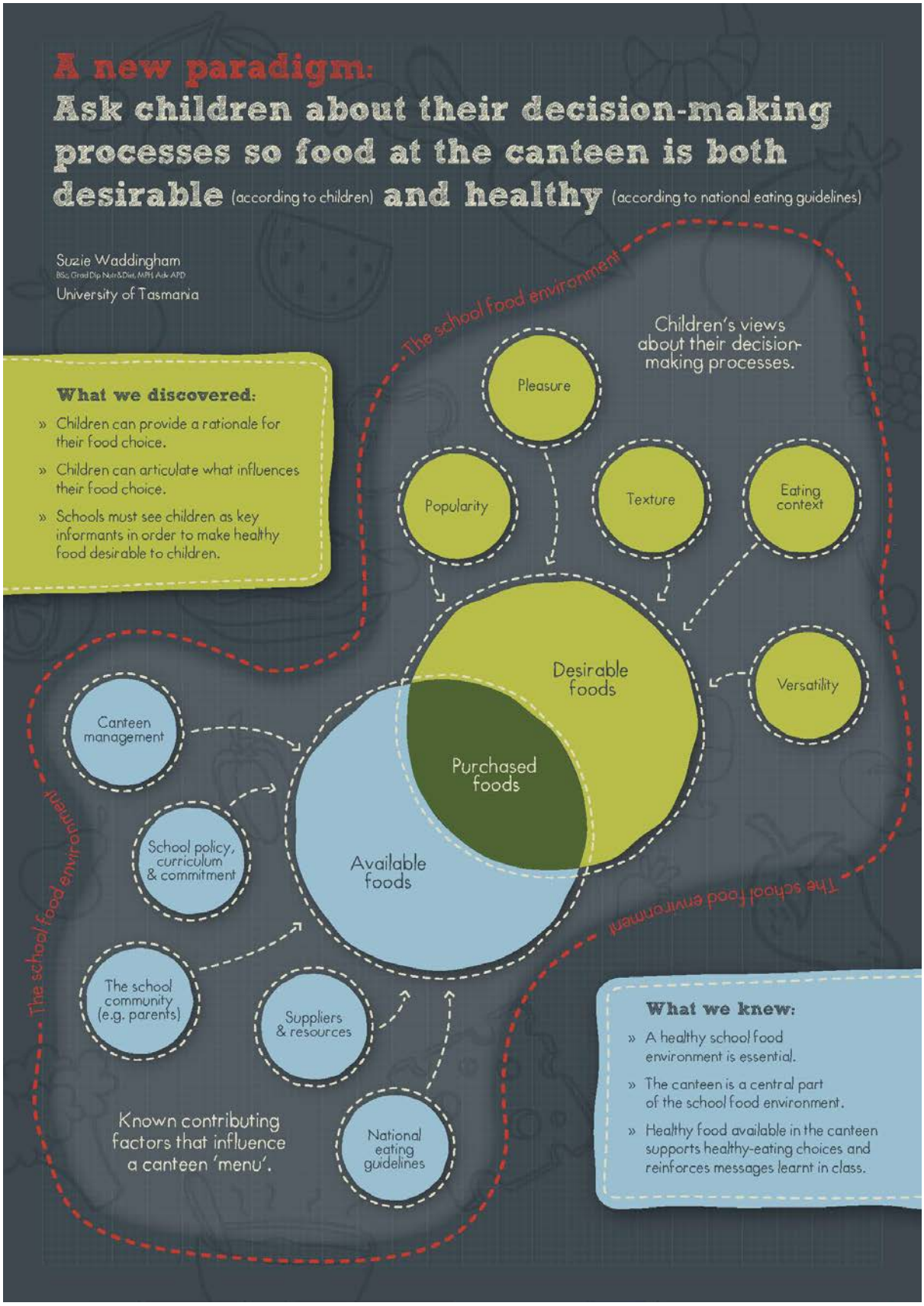

Figure 4 The model that was developed from the results of this research

Tables

Table 1 Top six favourite foods in the canteen (children can vote more than once)

Food classification	Food type	Number of votes
Red	*Confectionery (including 5 varieties)	83
Red	Crisps	49
Red	Ice cream or icy poles	35
Green	Salad rolls or wraps	30
Red	Chicken nuggets	23
Amber	Pizza	23

*Confectionery included five different food items; killer pythons, yoghurt babies, raspberry twists, lolly faces and yoghurt frogs

Table 2 Nine most frequently purchased foods from the canteen during one-day classified into Red, Amber and Green foods

	Food type	Lunch order	Over the counter	Number of total items sold	Percentage of total items purchased	Comments
Red	Confectionery	95	465	560	63.5 per cent	Many children bought more than one item on this particular day
Red	Chicken nuggets	110	46	156	18.0 per cent	Some children ordered in multiples
Red	Pies/sausage rolls	53	3	58	6.5 per cent	
Green	Flavoured milk	36		36	4.0 per cent	
Green	Chicken burger (with lettuce, tomato, mayo)	23		23	2.5 per cent	White roll

Amber	100per cent fruit juice	14	3	17	2.0 per cent	
Amber	Frozen pizza	14		14	1.5 per cent	
Green	Ham/cheese or cheese sandwich	13		13	1.5 per cent	White bread
Amber	Paddle pops/icy poles	6		6	0.5 per cent	These were not separated in the data collection

Appendix 2 has been removed for copyright or proprietary reasons.

It has been published as: Waddingham, S., Shaw, K., Van Dam, P., Bettiol, S., 2018. What motivates their food choice? Children are key informants, Appetite, 120, 514-522

Appendix 3 has been removed for copyright or proprietary reasons.

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WHY DO CHILDREN MAKE THE FOOD CHOICES THEY DO?: A PARTICIPATORY ACTION RESEARCH STUDY

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There is global consensus that the establishment of healthy eating habits in childhood is important for growth, development and future protection against chronic conditions. We used participatory action research to discover from the children themselves why they make the food choices they do. A convenience sample of 80–100 students was used from a primary school in Hobart, Tasmania. Five action learning cycles were used to collect data from the children and the canteen. Data were collected from an open class discussion, the canteen and two Discovery Days (where children worked in groups to design a healthy menu). Information about foods consumed was classified as 'red', 'amber' or 'green' using current evidence-based guidelines about food's health characteristics. Descriptive statistics and conventional content analysis were used to identify themes that emerged. Although 'green' foods featured on menus, 'red' foods were common choices when children were asked about favourite canteen foods and when designing their own menu. 'Red' and 'Amber' foods also dominated canteen foods offered. Emerging themes describing children's decision-making criteria include: pleasure, physical properties, consensus, versatility, weather dependant and ostensive logic. Our study found that children themselves are reliable informants about what factors influence their food choice. A child-centred approach could be the foundation required to build programs that support healthy decision-making behaviours and result in more effective healthy eating outcomes. We propose that school health promotion programs include the availability of mostly 'green' foods and are based on information from children's own decision-making criteria about food choice.

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IS THE QUEENSLAND COUNTRY WOMEN'S ASSOCIATION THE NEXT PUBLIC HEALTH NUTRITION ADVOCATE?

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Using a community capacity building framework, the Queensland Country Women's Association (QCWA) Country Kitchens (program) aims to deliver cooking skills workshops into more than 80 communities across remote, rural and regional areas of Queensland. This innovative nutrition promotion strategy builds on the strong community influence of QCWA to deliver key health messages Queenslanders cannot afford to ignore. The program funded by Queensland Government is a three-year health promotion initiative to increase fruit and vegetable consumption in the target audience of women aged 25 yrs+. The model of group education supported by peer leaders and practical guidance materials/resources will be delivered in five sessions into each intervention community. Incorporating building capacity, the program aims to bridge the gap in health outcomes between rural and urban communities by mobilising local networks through the community branch members. Using existing networks throughout Queensland, QCWA branch members will revolutionise the delivery of health promotion initiatives in this typically underserviced rural/remote region. Unique to this program, using empowerment strategies, the QCWA branches aim to develop community activities that are tailored to local needs, foster individual community's strengths and expand local networks. The practical considerations of planning such a public health strategy in partnership with an organisation solely based on volunteers, with a 93-year reputation for excellence in community service and home baking will be discussed. Will we be able to remain a culturally sensitive program, flexible and adaptable to the diversity of the needs of each community within the parameters of this historical organisation?

Funding source: Queensland Government

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PATTERNS OF BASELINE NUT CONSUMPTION IN THE HEALTHTRACK RANDOMISED CONTROLLED TRIAL

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Food supplementation in the context of dietary trials may improve participant adherence and enhance intervention effects. The HealthTrack randomised controlled trial was designed to explore the effect of an interdisciplinary intervention on weight loss and included an intervention arm supplemented with 30 grams of walnuts/day. Understanding nut consumption patterns at study commencement is needed to identify changes in intake over the duration of the study. The aim of this analysis was to explore baseline nut consumption in the HealthTrack study. Baseline dietary data were collected via diet histories (DH) and four-day food records (4DFR). Total nut (excluding peanut butter) and walnut consumption was identified, and the percentage of participants reporting nut intake via DH and 4DFR was calculated. Daily intake of total nuts and walnuts was also calculated. A total of n = 377 DH and n = 340 4DFR were available for analysis. Nut consumption was reported by n = 256 (67.9%) participants via DH and n = 135 (39.7%) participants via 4DFR. In comparison, walnut consumption was reported by n = 35 (9.3%) and n = 18 (5.3%) participants via DH and 4DFR, respectively. Among consumers, median (interquartile range) total nut consumption was 11.30 (5.54–25.04) grams/day in the DH and 12.65 (6.20–23.75) grams/day in the FR, while median walnut consumption was 8.14 (3.26–11.57) grams/day and 9.64 (4.55–14.44) grams/day in the DH and 4DFR, respectively. The proportion of participants reporting nut consumption varied between the DH and 4DFR, with under 10% reporting walnut consumption at baseline. Low baseline nut intakes indicate little likelihood of confounding from usual intakes in the study sample.

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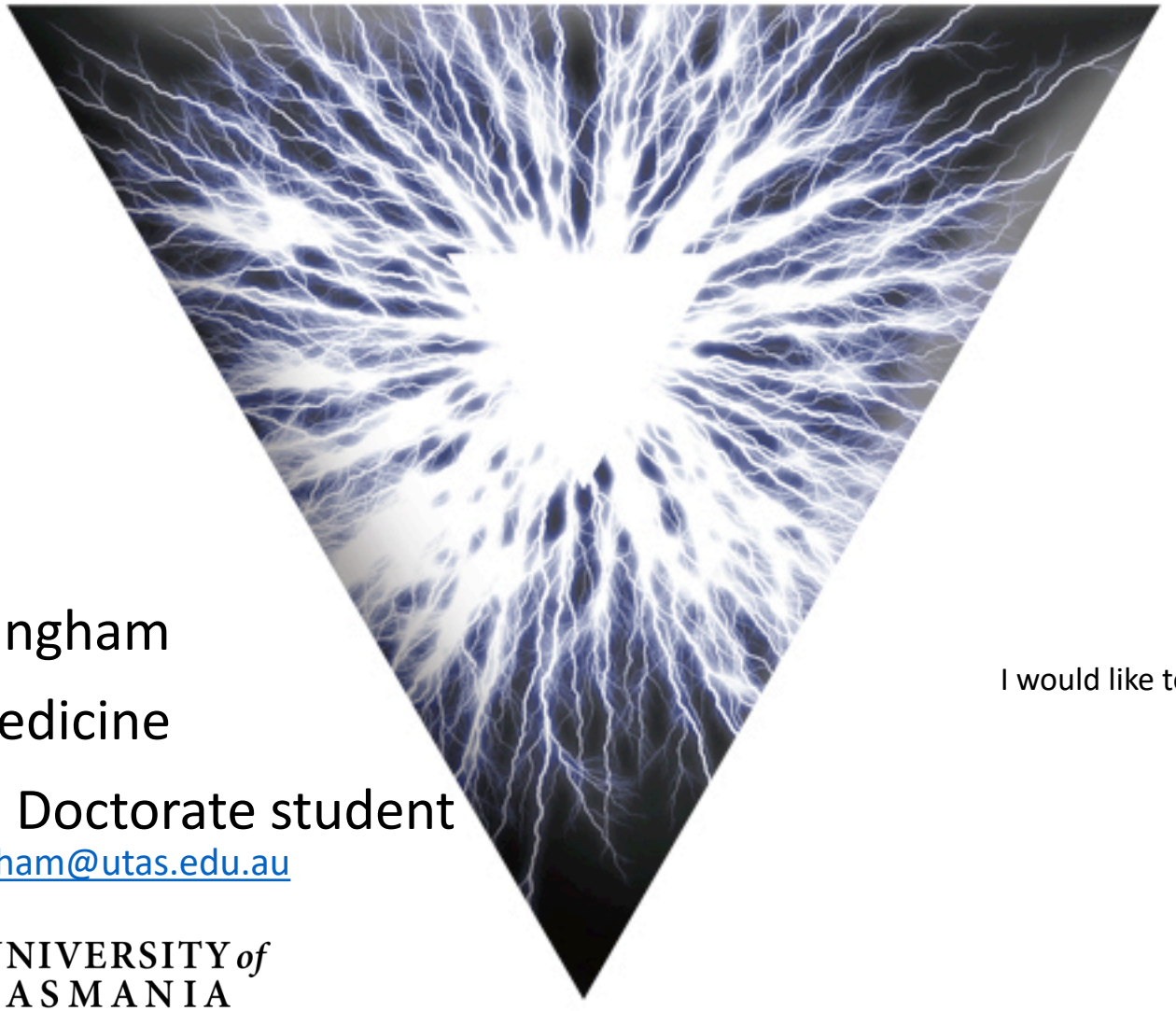
Final Professional Doctorate Presentation



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Dr Linda Murray

UNIVERSITY of TASMANIA

FACULTY OF HEALTH

Making healthy food desirable; perspectives from children

Acknowledgements

- The project school and research team

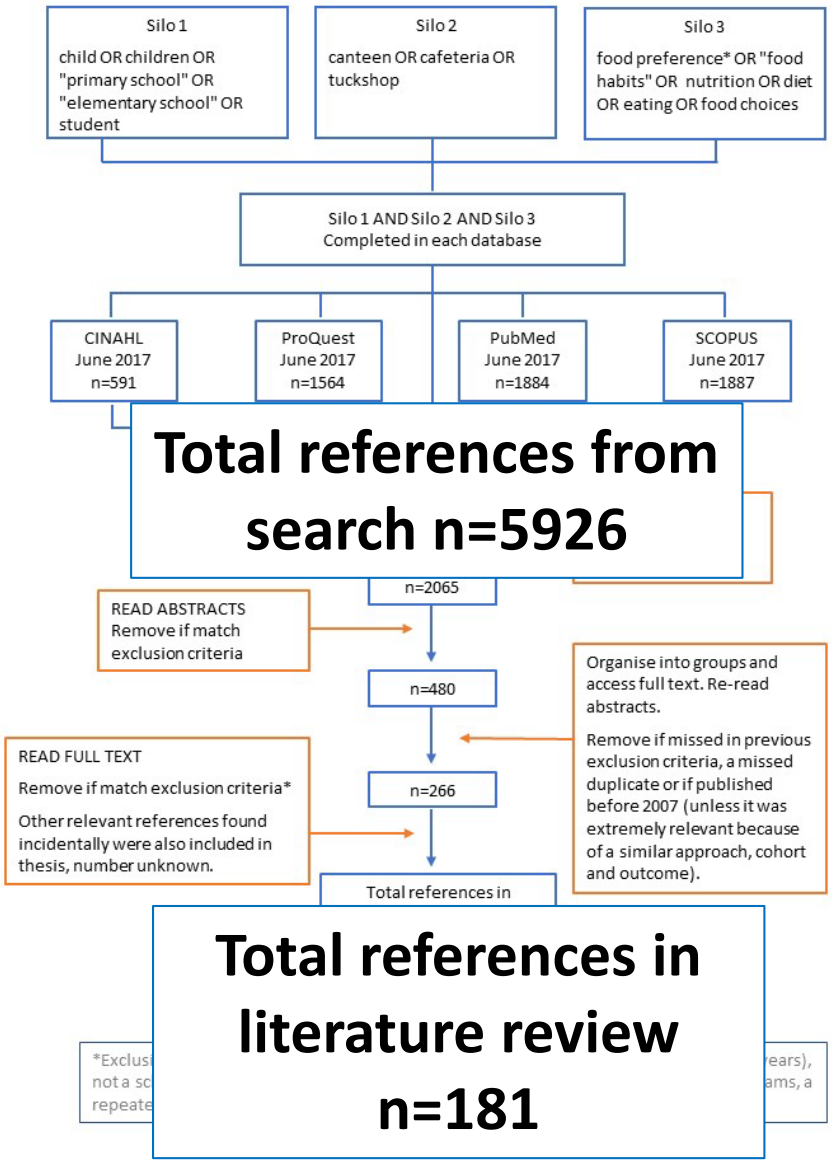
- My Professional Doctorate supervisors
  Dr. Silvana Bettiol
  Dr. Pieter Van Dam
  Dr. Kelly Shaw
  Dr. Linda Murray
  (Dr. Kate MacIntyre and Dr. Stella Stevens)

The research

Main phases

- Literature review
- PAR - 5 action cycles
- A theoretical model

The literature review prisma



A systematic method was used to search 4 databases

Three silos of MeSH and key words

Databases – CINAHL, ProQuest, PubMed, SCOPUS

Duplicates were removed

The same criteria was used to exclude papers after sweeping title, abstract then full papers

Background information

- Health is a resource for life
- Healthy eating is a protective determinant of health
- The Australian Dietary Guidelines are evidence-based and support the intake of healthy foods
- Most children are not eating according to the Australian Dietary Guidelines

The literature review

- Children are still driven by innate tastes
- Repeated exposure is important
- A healthy food environment is important and needs to be a multi- layered approach but changes are still moderate.
- A supportive environment enables healthy school food to become the ‘norm’ but more is required to have a bigger impact on food choice
- Adults views about reasons why children choose food is different to what children think
- There is a gap in knowledge about children’s version of what influences their food choice.

Why study children?

- Eating habits formed early in life persist into adulthood

  (Huon et al 1999, Scaglioni et al 2011)

- Only 2% of children aged 5-14 years ate the recommended serves of fruit and vegetables

  (AIHW 2016)

- Children consume nearly half of their daily energy intake from discretionary (unhealthy) foods

  (AIHW 2016)

- Collecting data from children is an obvious way to learn about children's decision making criteria

  (Thompson 1992, Smith & Greene 2014)

Why the school setting?

- Schools have regular and constant contact with children
- Children can consume up to 50% daily intake at school
- A healthy food environment supports children to make good choices but the impact on eating behaviours at school is inconsistent
- Healthy food needs to be available AND desirable for children - the school setting can support the discovery of strategies to achieve this

What is missing?

Very few studies asked children directly about their decision-making criteria for making food choices

Research questions

- Can children provide a rationale for their food choice?
- Can children articulate what influences their food choice?

Methods

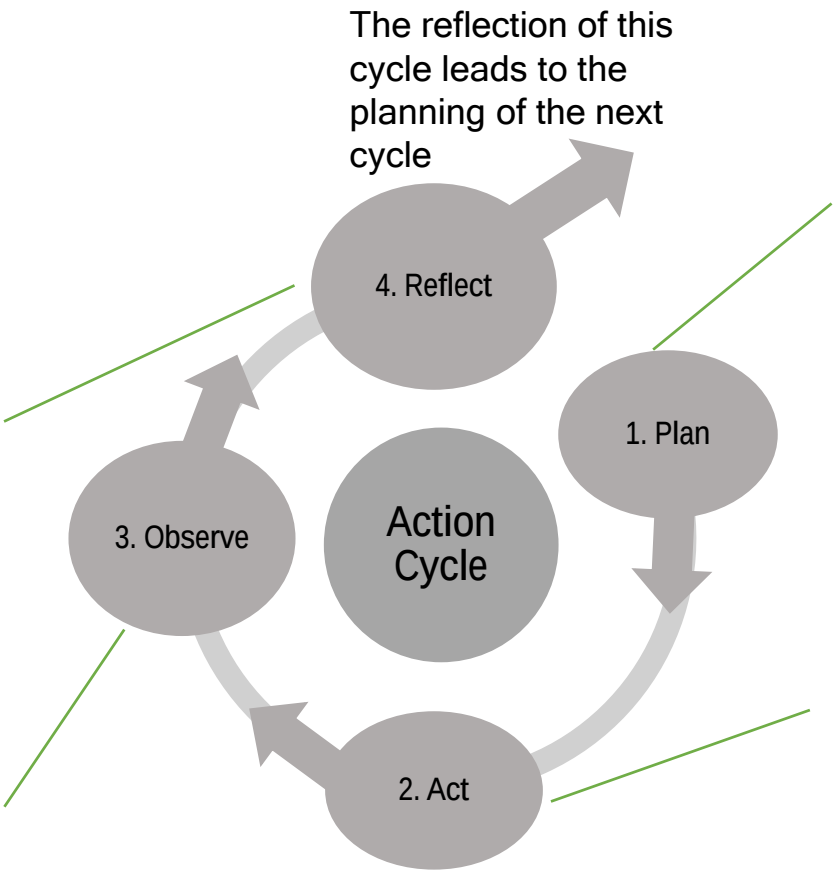
- Project team – 3 teachers, a parent, the principal, myself
- Convenience sample aged 5-12 years old
- Full ethics approval obtained (H0012935)
- Participatory Action Research – five cycles

- **Research methodology**
  - Participatory - giving children a voice
  - Qualitative/Inductive approach
  - Action research and learning

Methods - Participatory Action Research (PAR)

4. Reflection
- discuss the results with project team, decide what to do next. This reflection will inform the planning for the next cycle.

3. Observe the results - analyse and interpret the data collected and meet as a group to observe the outcomes



1. Plan first action cycle
- what will be collected or implemented, how will this be done and who will be doing it

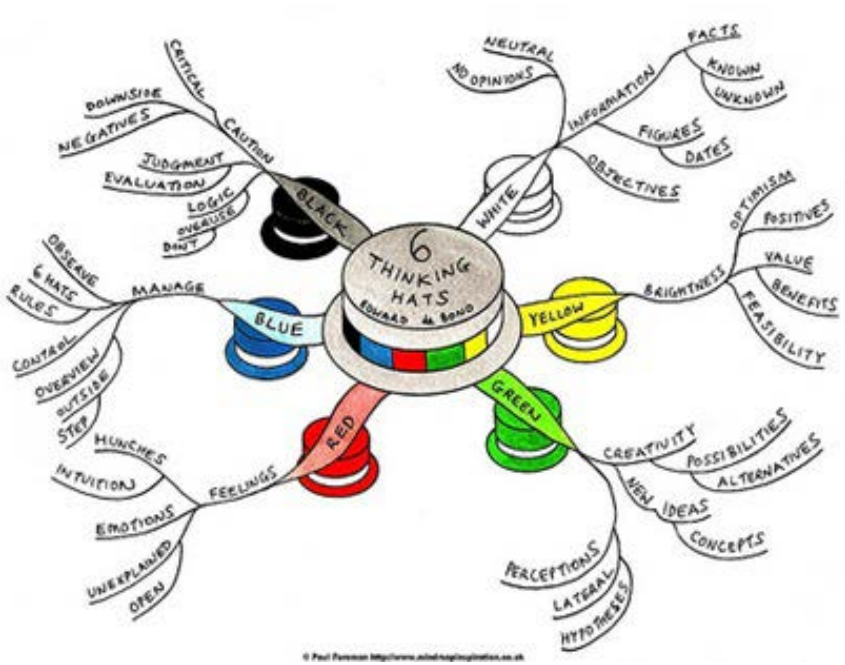
2. Act on the plan
- collect the data or implement the intervention

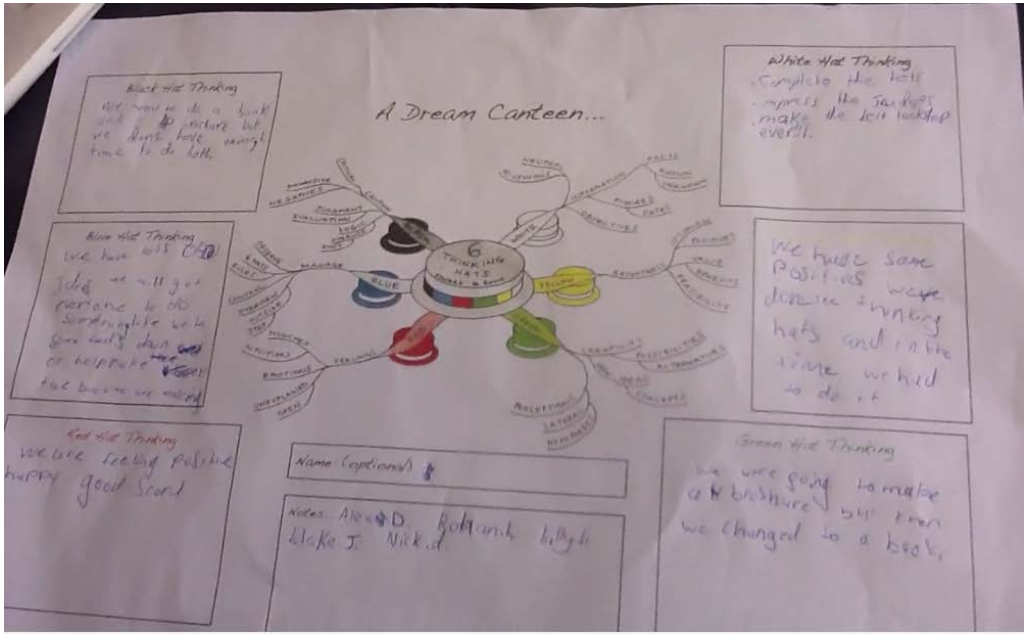
Methods - Participatory Action Research (PAR)

Action Cycle	Number of children	Method	Data collected by
1	80 (reported by teachers)	Open class discussion, semi-structured questions. Answers recorded on a template.	Teacher
2	372 (enrolled kinder – grade 6.)	Canteen for a day. Food available, purchased. Details recorded on an excel spreadsheet.	Parent
3	100 (reported by teachers)	Discovery day (DD). Video. Transcriptions completed.	Teachers Parent
4	235 (enrolled across grade 2-6)	Spaghetti Bolognaise for 1 lunch. Details recorded.	Parent
5	100 (reported by teachers)	Discovery day (DD). Video and worksheets. Transcriptions completed.	Teachers Researcher

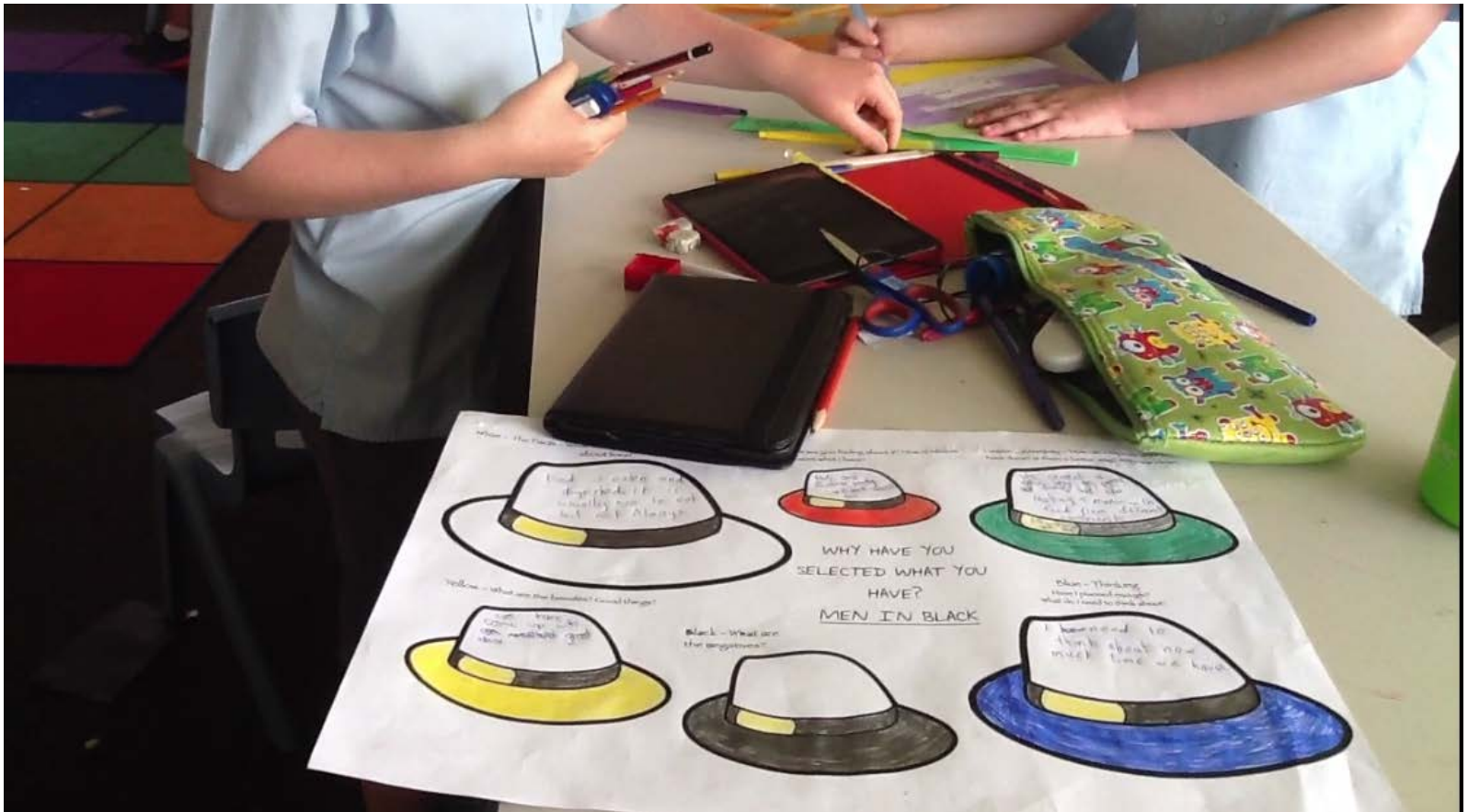
Food classified as Green, Amber and Red based on TSCA product list (based on National Health School Canteen Guidelines) except pies/sausage rolls

Methods – Discovery Day 1





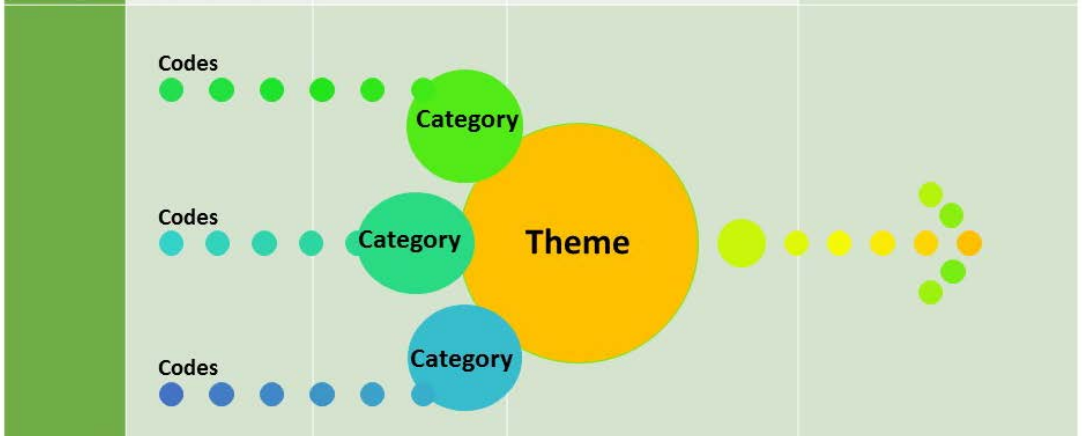
Methods – Discovery Day 2



Methods – data analysis

- Descriptive statistics
- Record of answers to open-end questions on excel
- Video clips observed and audio transcribed verbatim
- Conventional content analysis
- Conceptualisation of results over all the action cycles

	Codes	Categories	Themes	Theoretical concepts
Action Cycle 3 - Discovery Day one	Repeated quotes, phrases and words to describe why foods were chosen	Groups of codes that represent the same idea	Groups of categories that represent the same concept	Consider clusters or themes from Action Cycle 3 and 5 collectively to develop theoretical concepts
Action Cycle 5 - Discovery Day two	Repeated quotes, phrases and words to describe why foods were chosen	Groups of codes that represent the same idea	Groups of categories that represent the same concept	



Findings

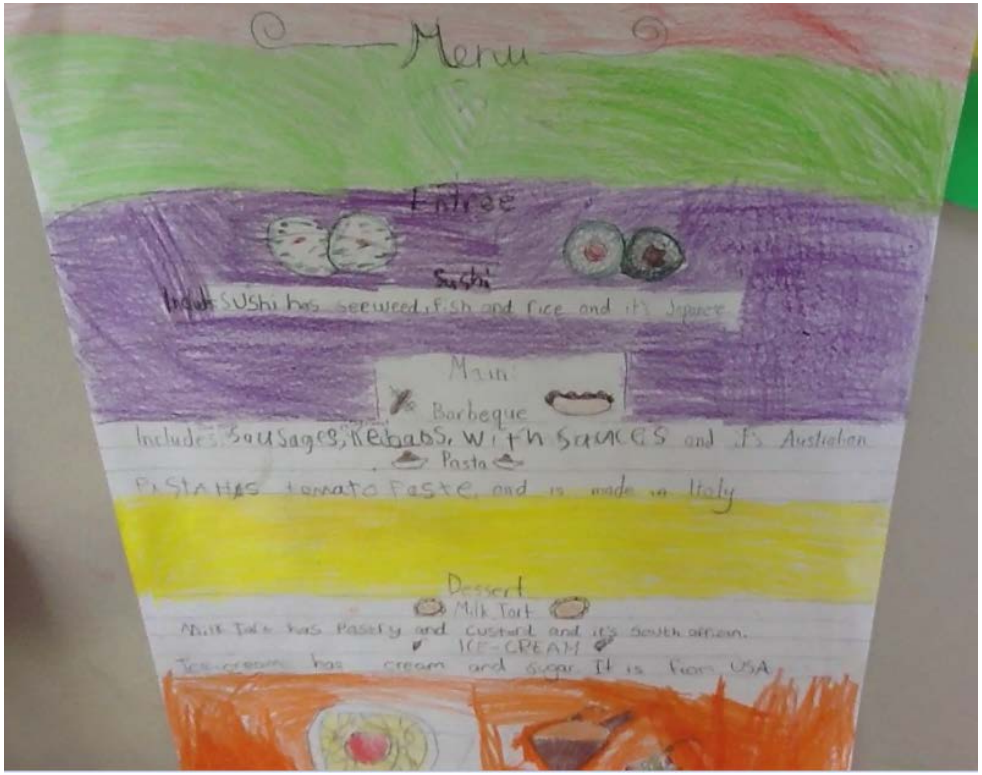
- The research
  - what we found
- Conceptualisation
  - integrating what we discovered with what we found to create a theoretical model

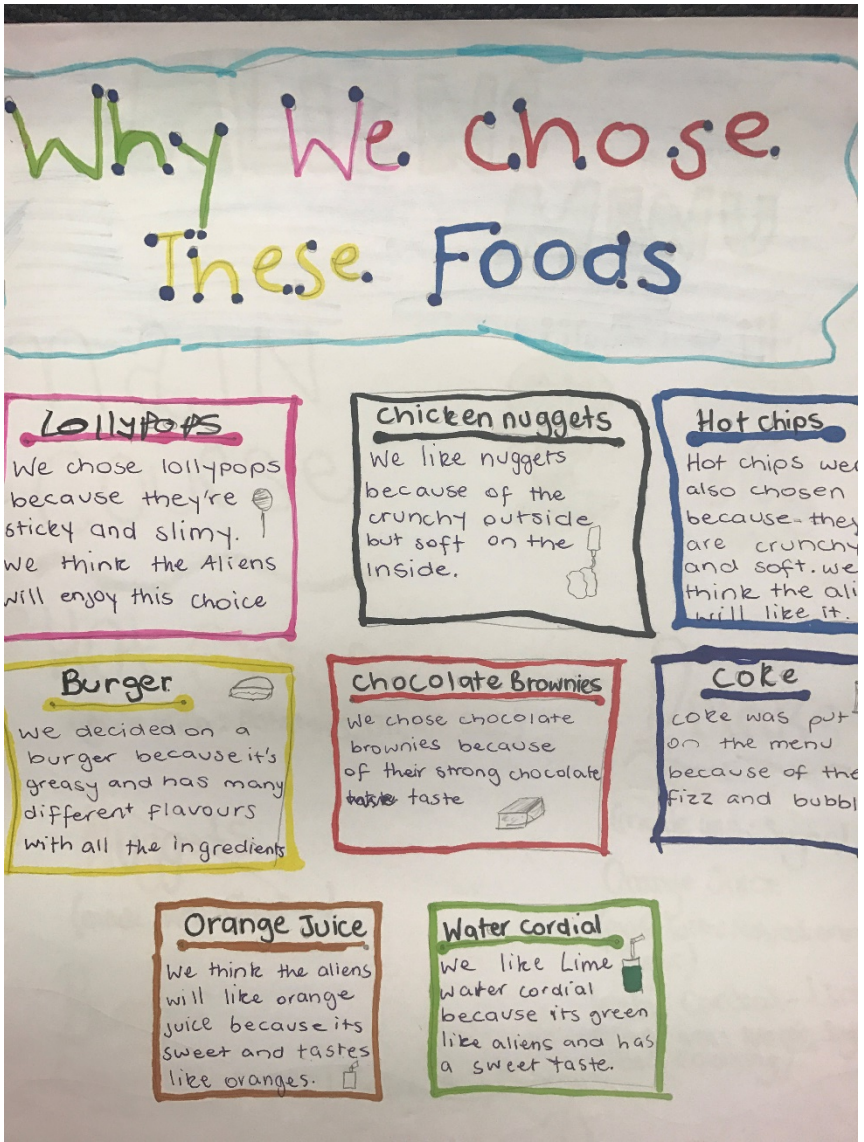
Findings - the research

- Most children reported buying from the canteen in the previous week
- Red and Amber foods = favourite canteen foods
- Green foods were available in the canteen but Amber and Red foods were more prominent
- Red and Amber foods = purchased the most
- Most Amber food was 'greened up' Red food

Findings - the research

- On the second Discovery Day menus were collected





Findings - the research

- Creation of a healthy menu = some Green, mostly Red and Amber foods

- A Green pasta dish incorporating children's criteria was offered on one day, 108 out of 235 students ordered

Findings – some codes and emerging themes

Knowledge based

"...most of them are junk food but we did put fruit on there and we have water"

Popularity

"sweet drinks because people don't like water"

Pleasure

"Tasty, the cheese is the star, it makes it delicious"

Findings – some codes and emerging themes

Eating context

Gummie bears – "because they are cute"

Versatility

"it comes with a lot of toppings you can choose from, because it's easy to make, ingredients are easy"

Texture

"I don't know. Just the stickiness"

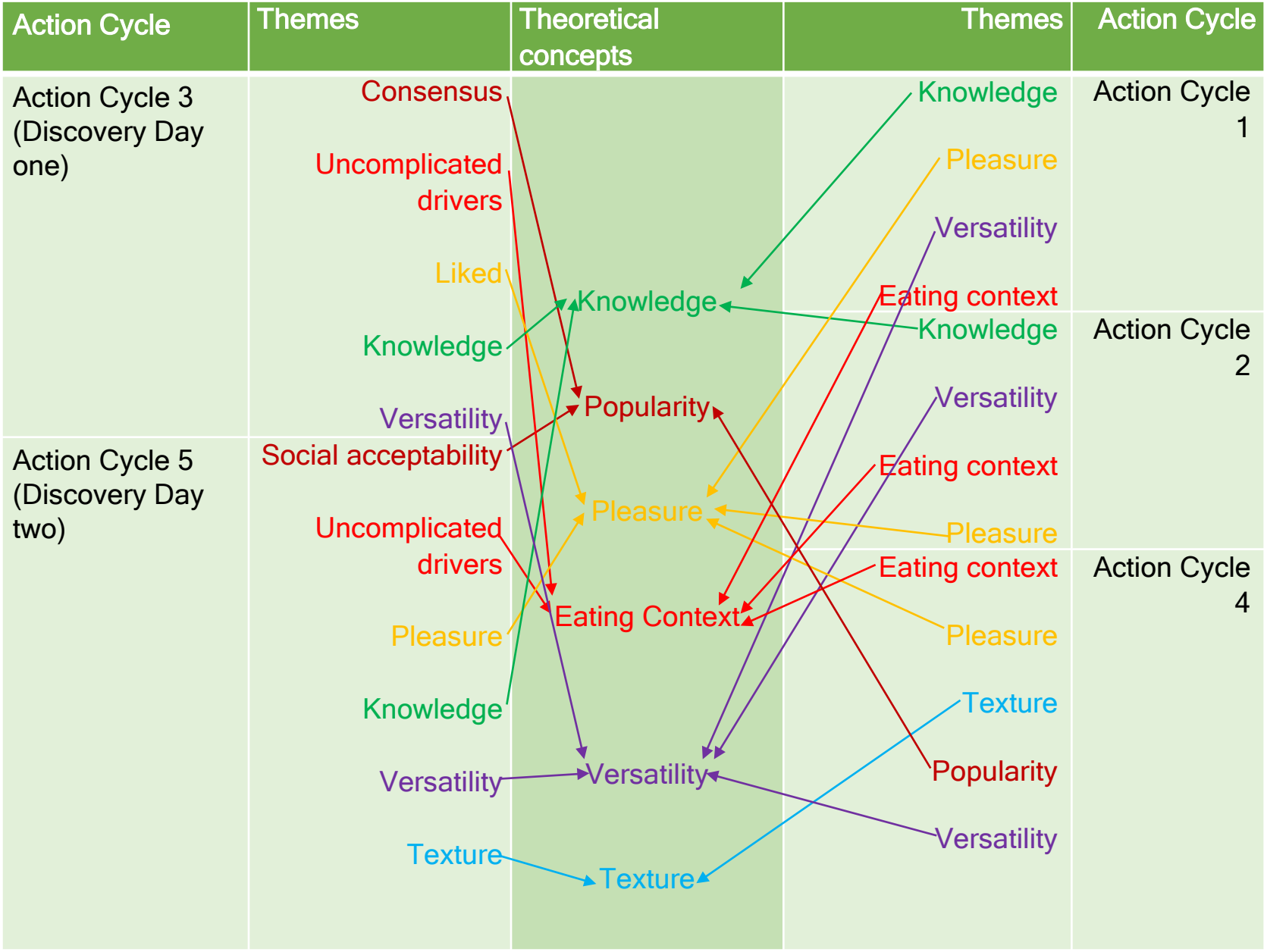
Findings – Key data from Action Cycles 3, 5

Action Cycle	Codes	Categories	Themes	Theoretical concepts
3 (Discovery Day one)	Repeated quotes, phrases and words to describe why foods were chosen	Tallies Assumptions Temperature related Children's logic Liked Links to healthy food Links to unhealthy food Links to ingredients or single components of food Limited understanding Easy to eat	Consensus Uncomplicated drivers Liked Knowledge Versatility Social acceptability	Knowledge Popularity
5 (Discovery Day two)	Repeated quotes, phrases and words to describe why foods were chosen	Tallies Assumptions Temperature related Shape Fun/cute Weather Liked Taste Nice Flavour Favourite Links to healthy food Links to unhealthy food Links to ingredients or single components of food Unknown Easy to make Easy to eat Variety of topping and ingredients to choose Melted Crispy Crunchy	Uncomplicated drivers Pleasure Knowledge Versatility Texture	Pleasure Eating Context Versatility Texture

Findings – Key data from Action Cycles 1, 2, 4

Action Cycle	Key data	Key themes
1	Children can describe healthy food but their favourite food available is unhealthy. When describing unhealthy food children say: It tastes good, more flavour, addictive, once tasted you want more. Quick, easy, cheap, can decide quickly, easy to make. Hot food warms you up, commercials are convincing, readily available, fills you up.	Knowledge Pleasure Versatility Eating context
2	Although healthy foods are available, dominant food purchased was unhealthy. The most popular food chosen from the canteen were: Easy to eat Warm Either sweet, salty and/or fatty	Knowledge Versatility Eating context Pleasure
4	The food offered for lunch included some of the emerging themes: Warm Salty (added cheese) Tasty Textural (cheese slightly melted) Popular Easy (used penne pasta for ease of eating)	 Eating context Pleasure Texture Popularity Versatility

Findings – theoretical concepts emerged from cycles

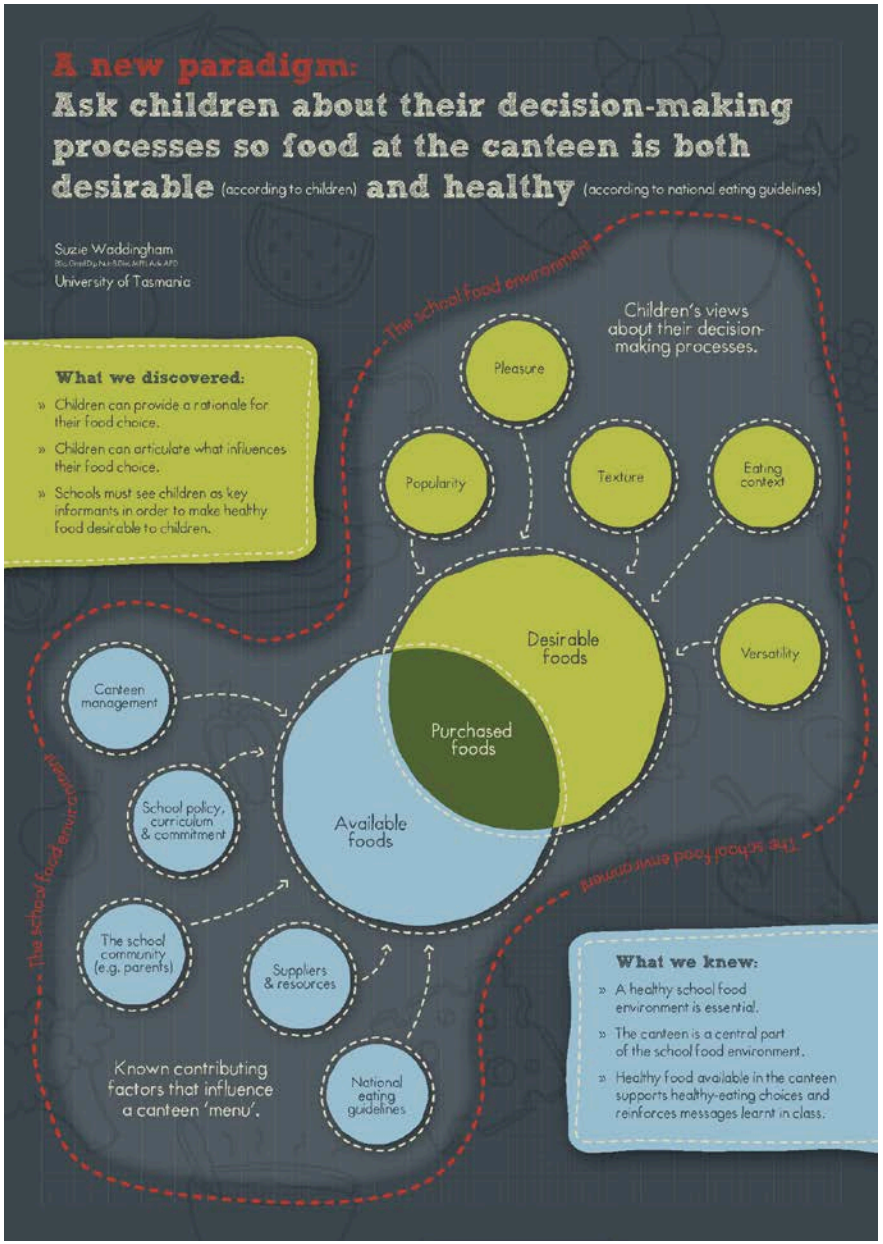


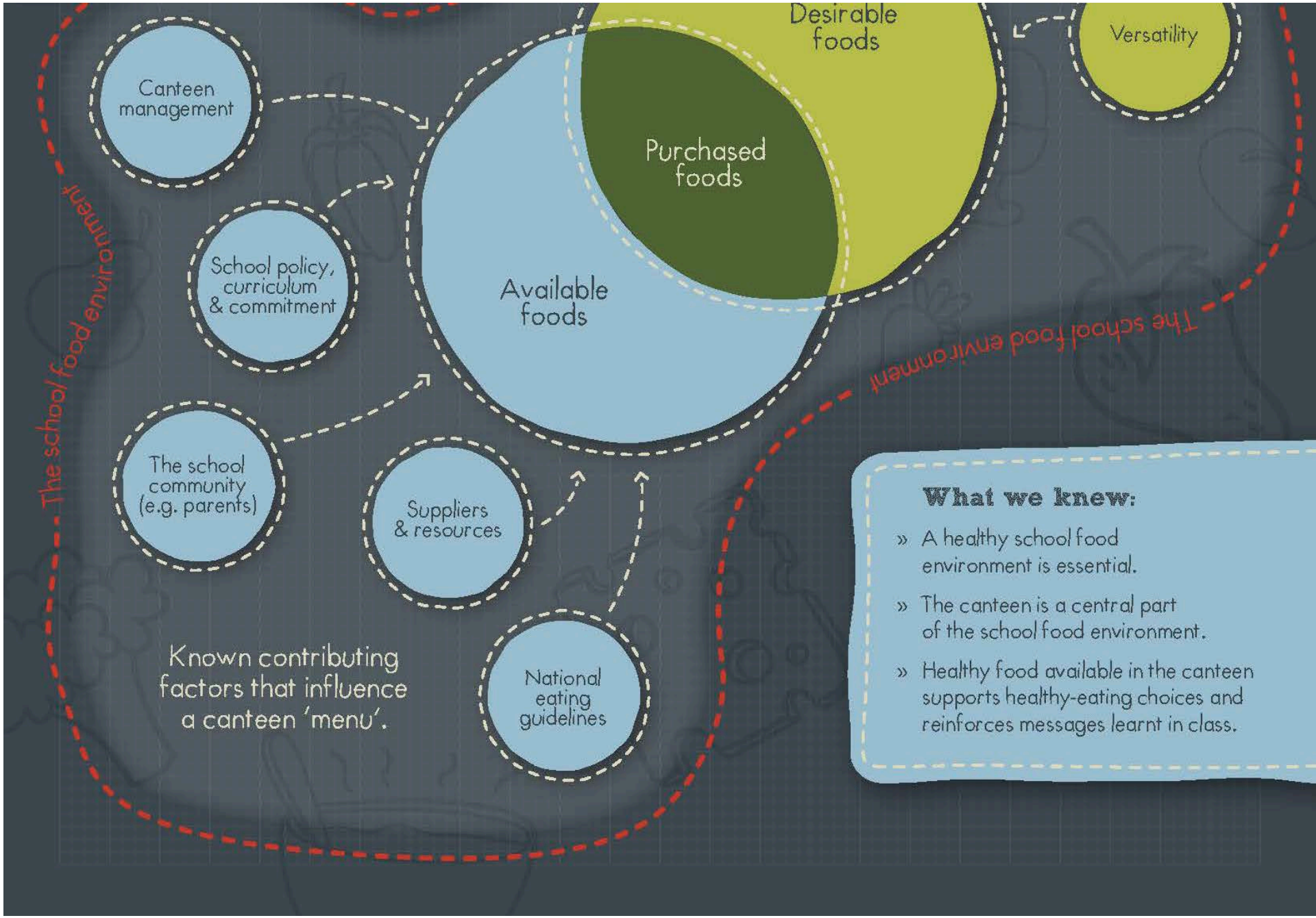
Findings – theoretical concepts emerged from cycles

Theoretical concepts
Doesn't influence eating behaviour
• Knowledge
Does influence eating behaviour
• Popularity
• Pleasure
• Eating Context
• Versatility
• Texture

Findings - The theoretical model

The concepts from the research were integrated with what we knew.




Desirable foods
Versatility
Canteen management
Purchased foods
School policy, curriculum & commitment
Available foods
The school food environment
The school food environment
The school community (e.g. parents)
Suppliers & resources
Known contributing factors that influence a canteen 'menu'.
National eating guidelines
What we knew:
» A healthy school food environment is essential.
» The canteen is a central part of the school food environment.
» Healthy food available in the canteen supports healthy-eating choices and reinforces messages learnt in class.

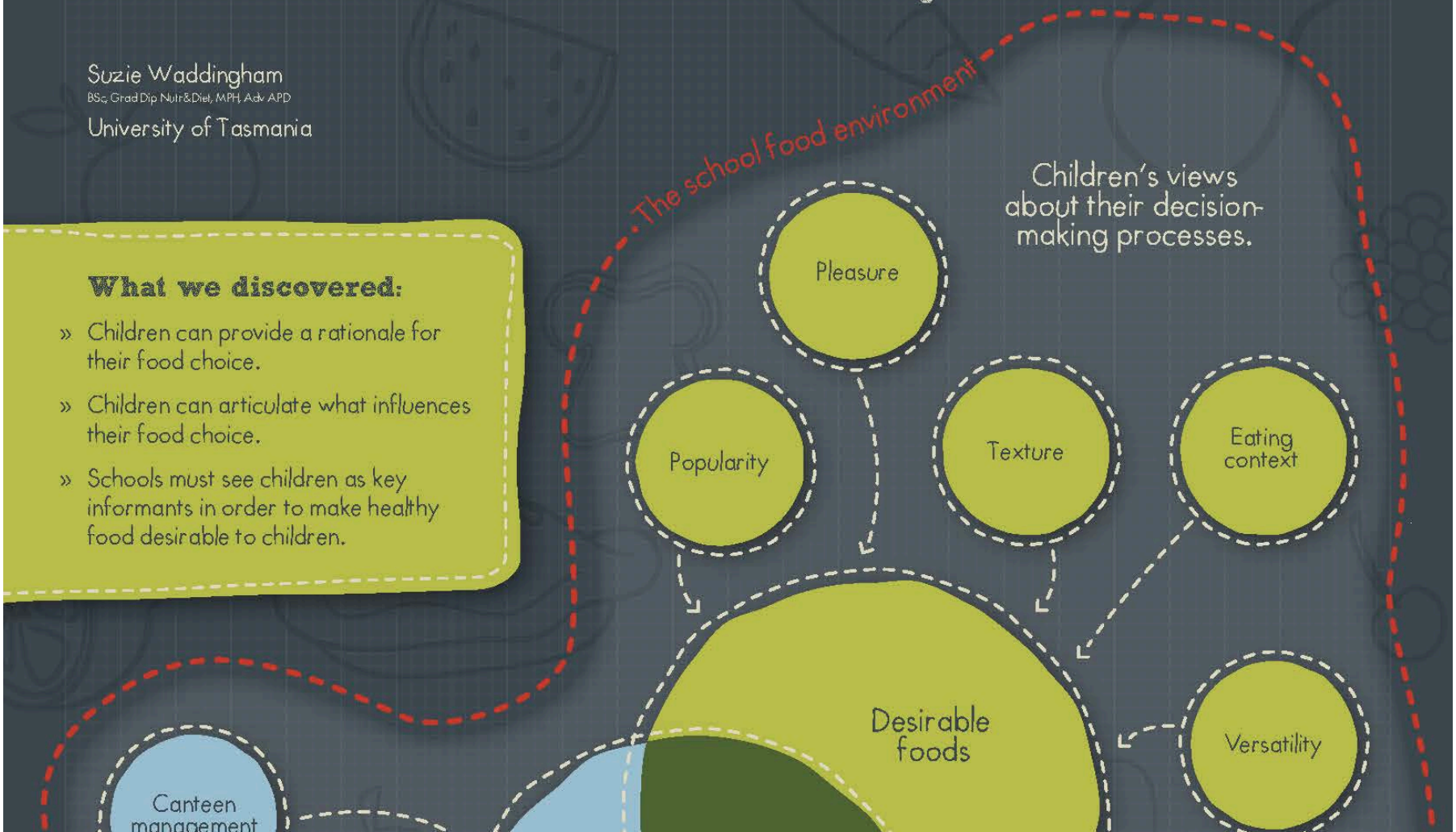
A new paradigm:

Ask children about their decision-making processes so food at the canteen is both desirable (according to children) and healthy (according to national eating guidelines)

Suzie Waddingham
BSc, Grad Dip Nutr&Diet, MPH, Adv APD
University of Tasmania

What we discovered:

- Children can provide a rationale for their food choice.
- Children can articulate what influences their food choice.
- Schools must see children as key informants in order to make healthy food desirable to children.



Conclusions

What we knew

- Start with a healthy food environment that is consistent across the whole environment.
  - = promote healthy messages in the classroom, through curriculum, in the school community, in school policy and in the canteen.

- Use multi-layered approaches to promote healthy eating in the school setting.

- Be aware that adults views about reasons why children choose food is different to what children think

Conclusions

What we discovered

- Children are key informants for making healthy food desirable for children
- A Discovery Day is an effective tool to work with children

Key policy recommendations

1. School health promotion programs should be based healthy food environments and healthy foods in the canteen that are desirable TO CHILDREN

2. Amber foods offered in the canteen should all be based on green foods and match children's food decision-making criteria

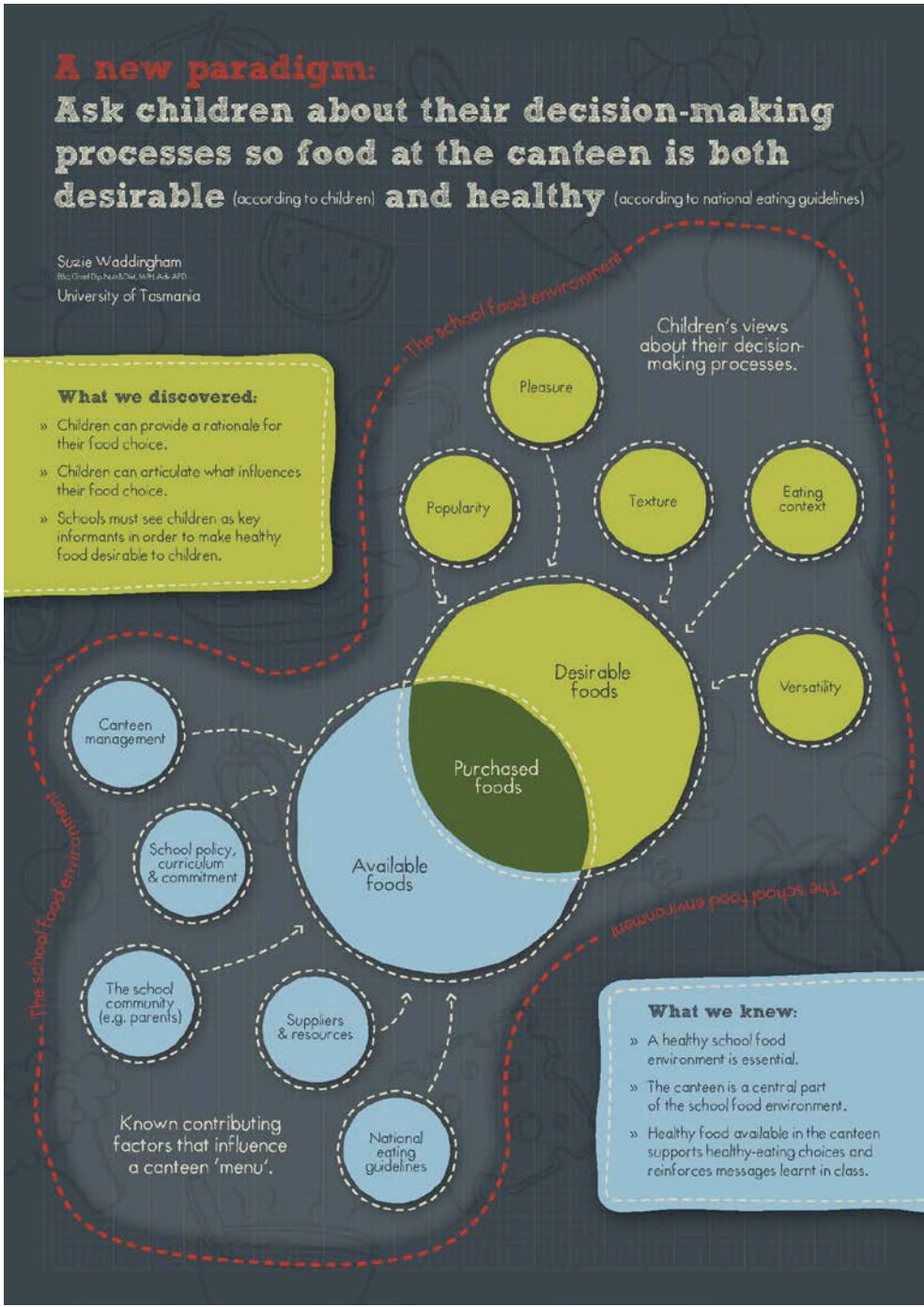
3. Healthy Green foods offered in the school setting should incorporate children's food decision-making criteria

What's Next?

1. Repeat research in a variety of primary schools.

2. Test the model in a variety of primary schools and measure the effect on the purchase of healthy food.

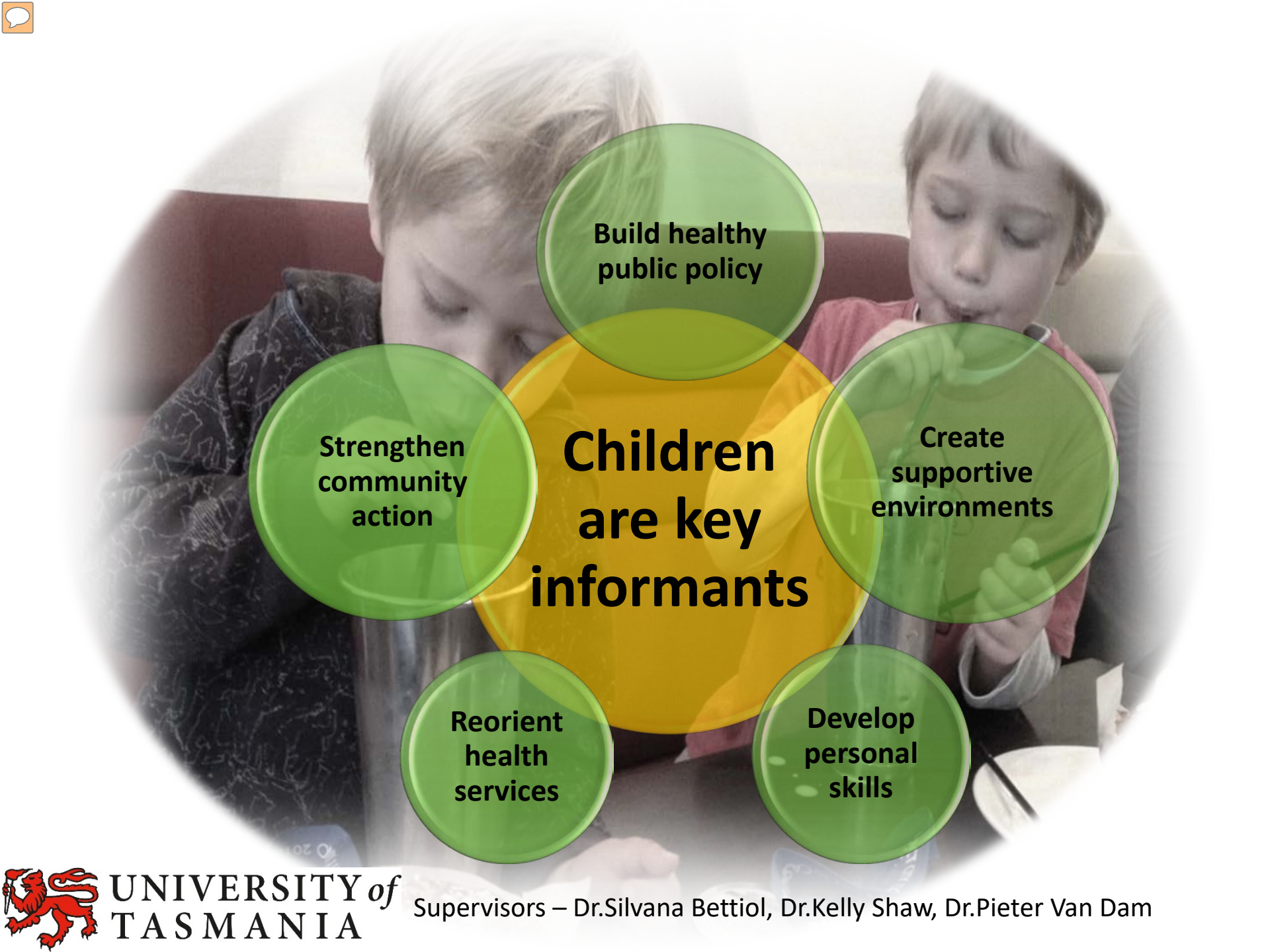
3. Repeat research among a variety of ages.



Questions

Suzie Waddingham
Faculty of Health
School of Medicine

- **Children are key informants about what motivates their food choice**



UNIVERSITY of TASMANIA

Supervisors – Dr.Silvana Bettiol, Dr.Kelly Shaw, Dr.Pieter Van Dam

UNIVERSITY of TASMANIA

Why do children make the food choices they do- a participatory action research study

Suzie Waddingham, Dr. Kelly Shaw,
Dr. Linda Murray, Dr. Silvana Bettiol

FACULTY OF HEALTH

Background Information

Healthy eating habits have a significant impact on health

The Australian Dietary Guidelines are evidence based and support the intake of nutritious foods

Many children are not eating according to the Australian Dietary Guidelines

Why study children?

Habits formed early in life persist into adulthood
(Huon et al 1999, Scaglioni et al 2011)

Choice is important to create a habit
(Costanzo et al 1985, Satter 2008)

A healthy food environment supports children to make good choices
(Birch and Fisher 1998, Hanks et al 2013)

Collecting data from children is an obvious way to learn about children's decision making criteria
(Thompson 1992, Smith & Greene 2014)

What is missing ?

1. Limited studies available that asked children directly about their food decision-making criteria

2. Out of 38 countries and the USA, 8 share a similar school lunch model to Australia

Methodology

- Giving children a voice
- Qualitative/Inductive approach
- Participatory Action Research (PAR)

Methodology

- A Public Health perspective based on the Ottawa Charter for health promotion

- Key concept of health promotion – empowerment

Methods

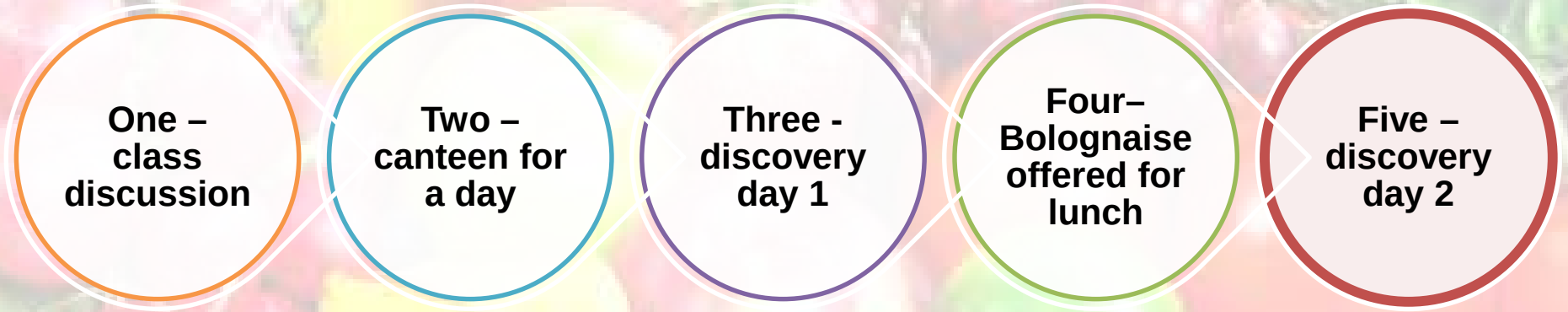
- PAR
- Tasmanian primary school
- Ask the children directly about their food choices
- Foods classified as GREEN, AMBER, RED

Methods

- Project team – 3 teachers, a parent, the principal, myself
- 5 action cycles 2012-2013
- Convenience sample aged 5-12 years old
- Depending on cycle n= 80-372 students
- Full UTas ethics approval obtained (H0012935)

Methods

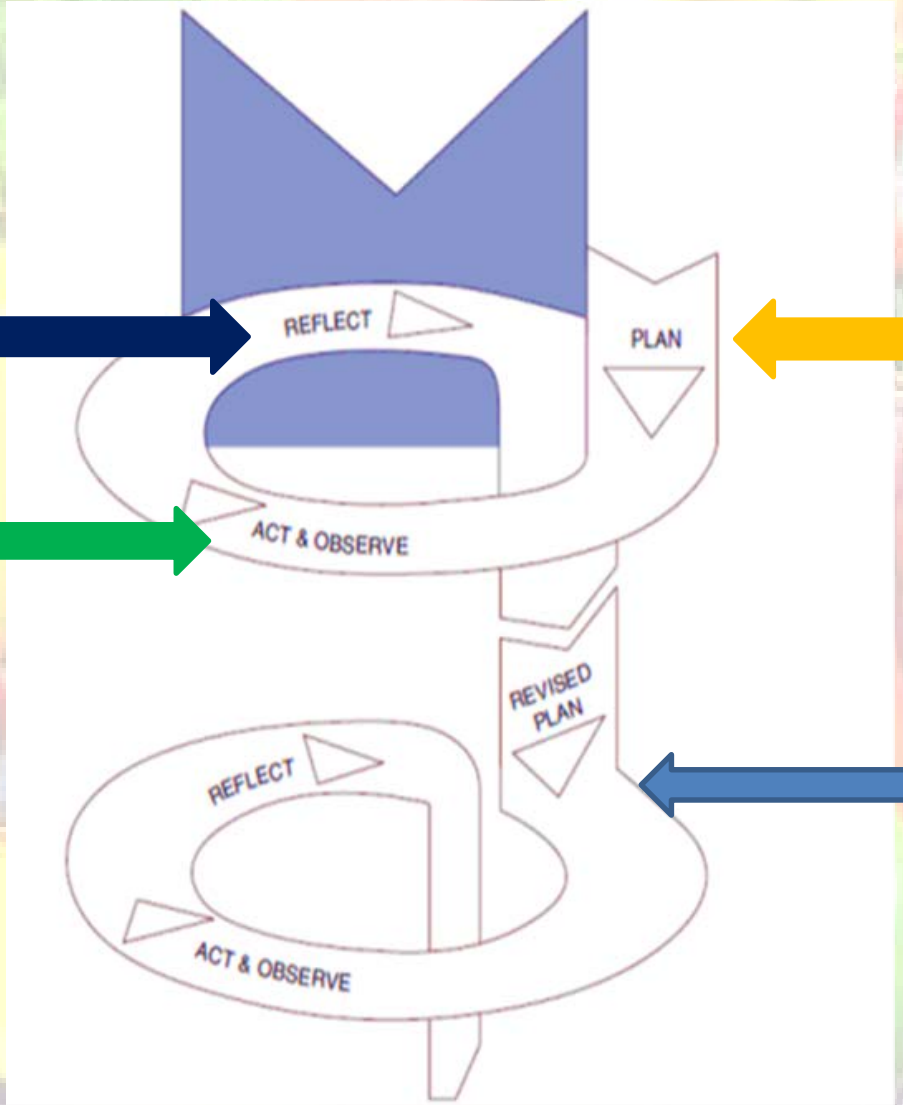
Five action cycles were completed with a Tasmanian non-government catholic primary school



Methods

4. Reflect and discuss the results with project team, decide what to do next

1. Plan first action cycle – open class discussion with 80 students



2. Act on the plan – complete class discussion. Teacher collected data

3. Observe the results with project team

5. Plan how and what to collect for the next round of data collection – A day in the canteen. Repeat process again

Methods

Action Cycle	Number of children	Method	Data collected by
1	80 (reported by teachers)	Open class discussion, semi-structured questions. Answers recorded on a template.	Teacher
2	372 (enrolled kinder – grade 6. 2012)	Canteen for a day. Food available, purchased. Details recorded on an excel spreadsheet.	Parent
3	100 (reported by teachers)	Discovery day (DD). Video. Transcriptions completed.	Teachers Parent
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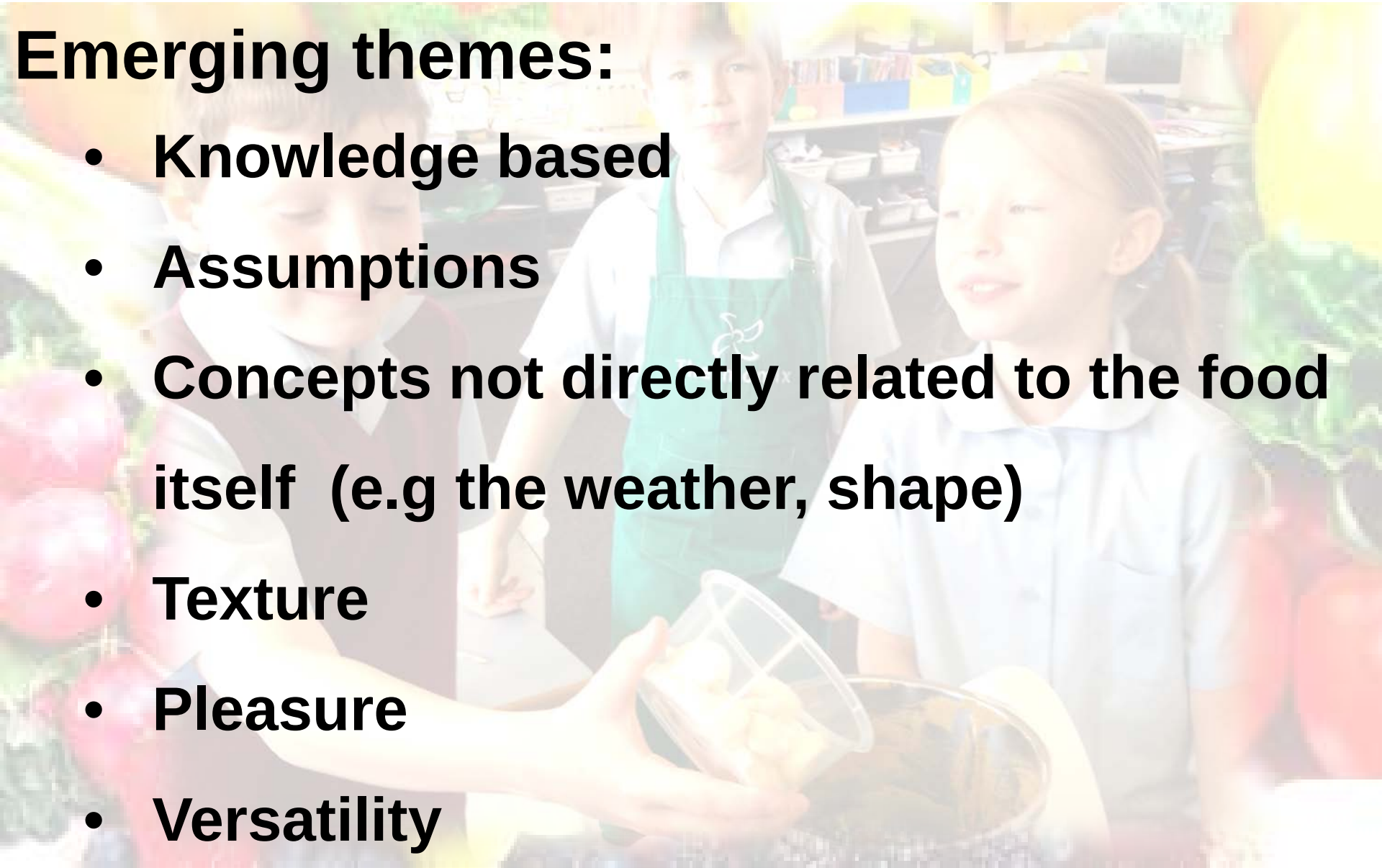
OVERVIEW

- Most children reported buying from the canteen in the previous week
- Red and Amber foods = favourite canteen foods
- Green foods were available in the canteen but Amber and Red foods were more prominent
- Red and Amber foods = purchased the most

OVERVIEW

- **Creation of a healthy menu = some Green, mostly Red and Amber foods**
- **Pasta was reported as a favourite Green food, when offered on one day, 108 out of 235 students ordered**

OVERVIEW



Emerging themes:

- Knowledge based
- Assumptions
- Concepts not directly related to the food itself (e.g the weather, shape)
- Texture
- Pleasure
- Versatility

Examples of themes and quotes

<u>Knowledge based</u>

"…most of them are junk food but we did put fruit on there and we have water"

<u>Assumed popularity</u>

"sweet drinks because people don't like water"

<u>Concepts about food - shape</u>

Gummie bears – "because they are cute"

Examples of themes and quotes

Texture

"I don't know. Just the stickiness"

Pleasure

"Tasty, the cheese is the star, it makes it delicious"

Versatility

"it comes with a lot of toppings you can choose from, because it's easy to make, ingredients are easy"

Conclusions

Start with a healthy food environment

Children are key informants

A Discovery Day is an effective tool to work with children

Practical Implications

School health promotion programs could be based on ADGs, healthy food environments and children's decision-making criteria

Public Health implications

- **Empower children to be more involved in improving health outcomes.**
- **Build healthy public policy by health, education and communities working together to:**
  - **create supportive healthy food environments in all schools so it becomes the norm**
  - **Invest in research to learn more about what influences children's decision making around food from children**
- **It is not suggested the findings are generalisable across all schools or other settings**

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Questions

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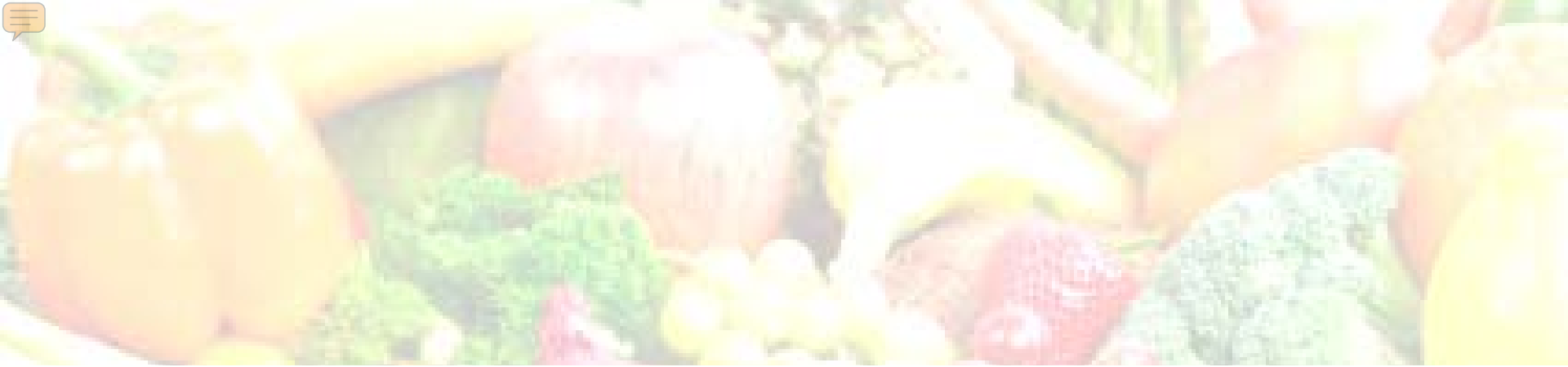
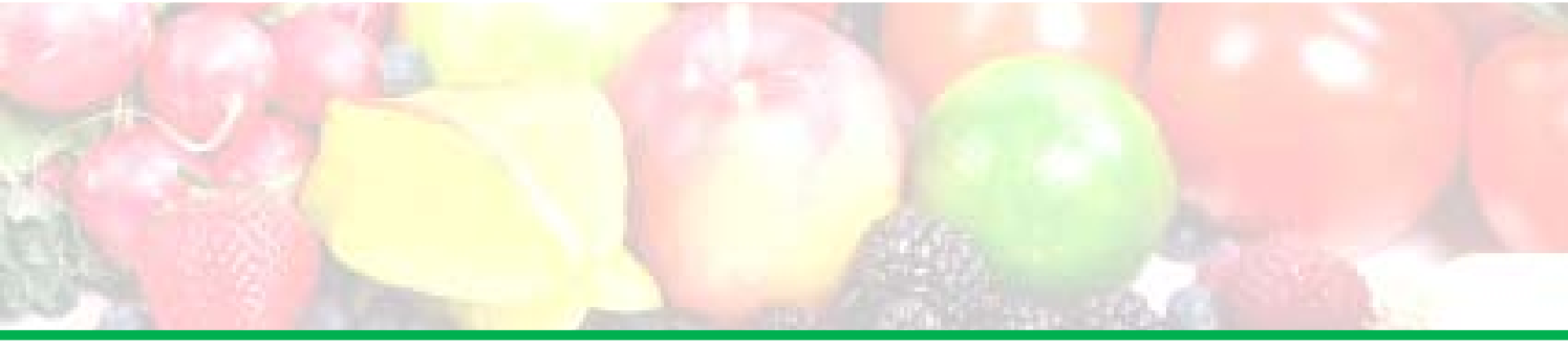


Children want hot food on cold days; how to investigate what influences children's food choice



Suzie Waddingham Adv APD, MPH

Suzie Waddingham Adv APD, MPH

What do we know?

The Australian Dietary Guidelines are evidence based and support the intake of nutritious foods.

Many children are not eating according to the Australian Dietary Guidelines.

Suzie Waddingham Adv APD, MPH

Suzie Waddingham Adv APD, MPH

Design

Suzie Waddingham Adv APD, MPH

Purpose

Suzie Waddingham Adv APD, MPH

Design

Five action cycles were completed with a Tasmanian non-government catholic primary school

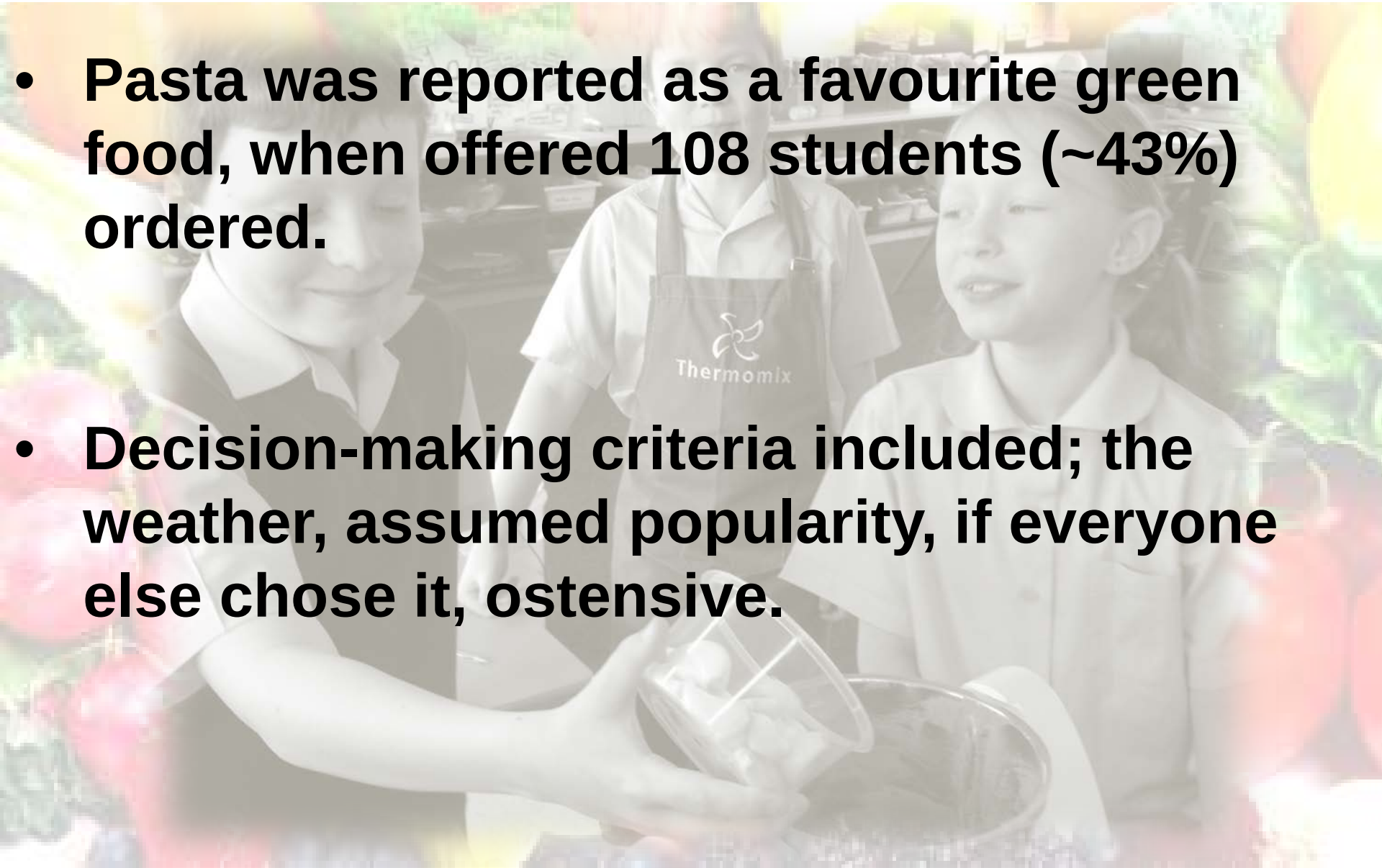
Methods & Key Findings

Suzie Waddingham Adv APD, MPH

OVERVIEW

- Red and Amber foods = favourite canteen foods.
- Green foods were available in the canteen but Amber and Red foods were more prominent.
- Red and Amber foods = purchased the most
- Creation of a healthy menu = some Green, mostly Red and Amber foods

OVERVIEW



- **Pasta was reported as a favourite green food, when offered 108 students (~43%) ordered.**

- **Decision-making criteria included; the weather, assumed popularity, if everyone else chose it, ostensive.**

The weather

"hot chips because people want on cold days"

Assumed popularity

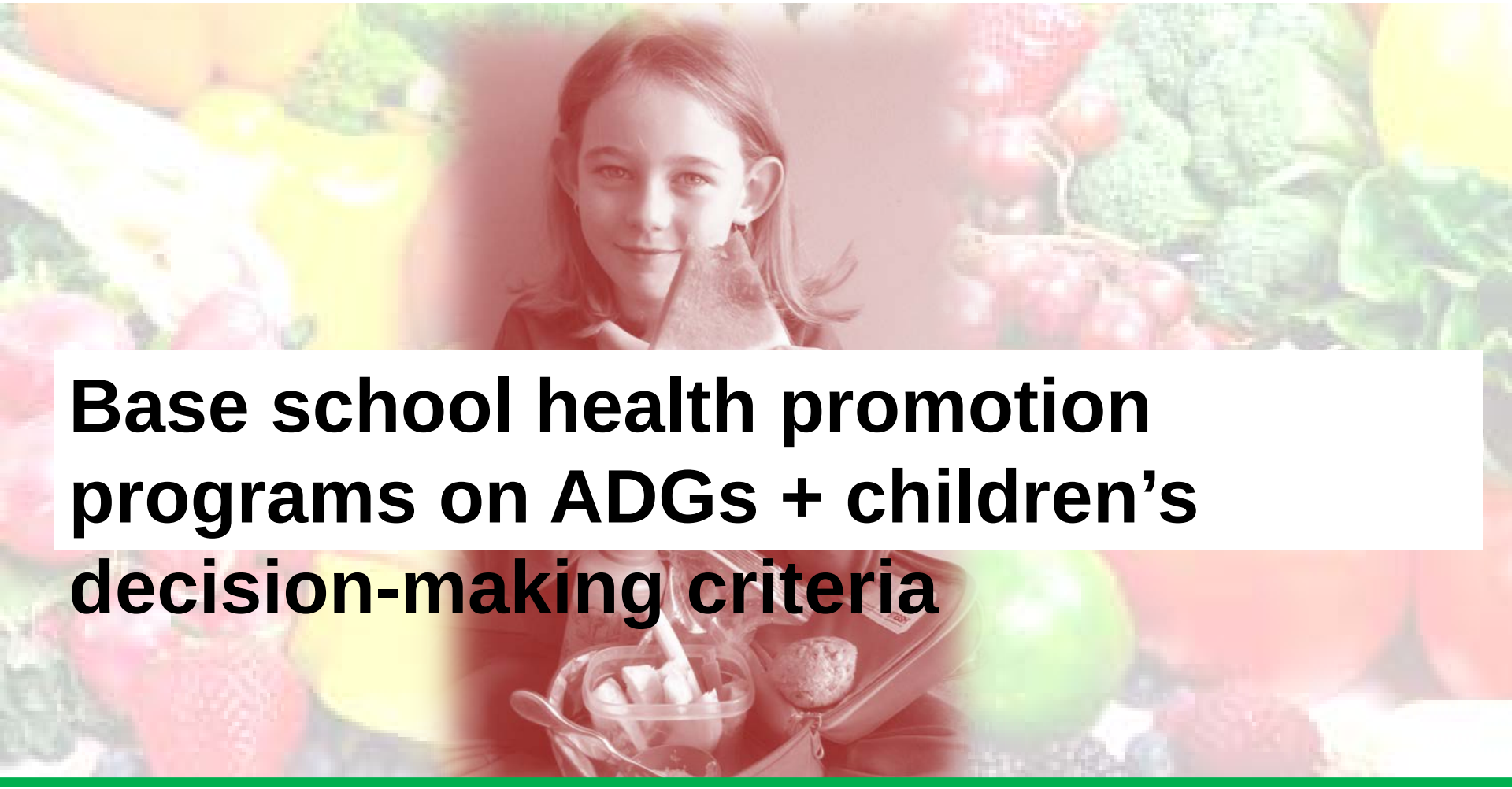
"sweet drinks because people don't like water"

Conclusions

Children are key informants

Suzie Waddingham Adv APD, MPH

Practical Implications



Base school health promotion programs on ADGs + children's decision-making criteria

Suzie Waddingham Adv APD, MPH

Questions

Suzie Waddingham Adv APD, MPH

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HUMAN RESEARCH ETHICS COMMITTEE (TASMANIA) NETWORK

22 March 2013

Dr Kate Macintyre
School of Medicine
Private Bag 34

Student Researcher: Suzanne Waddingham

Sent via email

Dear Dr Macintyre

Re: FULL ETHICS APPLICATION APPROVAL
Ethics Ref: **H0012935 - Making healthy choices easy choices – taking students on their own food journey**

We are pleased to advise that the Tasmania Social Sciences Human Research Ethics Committee approved the above project on 22 March 2013.

This approval constitutes ethical clearance by the Tasmania Social Sciences Human Research Ethics Committee. The decision and authority to commence the associated research may be dependent on factors beyond the remit of the ethics review process. For example, your research may need ethics clearance from other organisations or review by your research governance coordinator or Head of Department. It is your responsibility to find out if the approval of other bodies or authorities is required. It is recommended that the proposed research should not commence until you have satisfied these requirements.

Please note that this approval is for four years and is conditional upon receipt of an annual Progress Report. Ethics approval for this project will lapse if a Progress Report is not submitted.

The following conditions apply to this approval. Failure to abide by these conditions may result in suspension or discontinuation of approval.

1. It is the responsibility of the Chief Investigator to ensure that all investigators are aware of the terms of approval, to ensure the project is conducted as approved by the Ethics Committee, and to notify the Committee if any investigators are added to, or cease involvement with, the project.

2. Complaints: If any complaints are received or ethical issues arise during the course of the project, investigators should advise the Executive Officer of the Ethics Committee on 03 6226 7479 or human.ethics@utas.edu.au.

3. Incidents or adverse effects: Investigators should notify the Ethics Committee immediately of any serious or unexpected adverse effects on participants or unforeseen events affecting the ethical acceptability of the project.

4. Amendments to Project: Modifications to the project must not proceed until approval is obtained from the Ethics Committee. Please submit an Amendment Form (available on our website) to notify the Ethics Committee of the proposed modifications.

5. Annual Report: Continued approval for this project is dependent on the submission of a Progress Report by the anniversary date of your approval. You will be sent a courtesy reminder closer to this date. **Failure to submit a Progress Report will mean that ethics approval for this project will lapse.**

6. Final Report: A Final Report and a copy of any published material arising from the project, either in full or abstract, must be provided at the end of the project.

Yours sincerely

Katherine Shaw
Ethics Officer
Tasmania Social Sciences HREC

SOCIAL SCIENCES HREC

FULL COMMITTEE APPLICATION

Important

Please email an electronic version of this application plus the supporting documentation as Microsoft Word documents to:

Katherine.Shaw@utas.edu.au

A .pdf attachment is acceptable for appropriate documents, eg., advertisements, posters, etc.

A signed copy of this form also needs to be forwarded electronically.

If you have any questions, please call: 6226 2763

1. Title of proposed investigation
Please be concise but specific. Titles should be consistent with those used on any external funding application. **Making healthy choices easy choices – taking students on their own food journey**

2. Expected commencement date:	**Expected completion date of project**
On approval of ethics	2014

3. Investigators:

CHIEF INVESTIGATOR

Note: This is the researcher with ultimate responsibility for the research project.

The Chief Investigator cannot be a student.

Given Name Dr Kate **Surname** MacIntyre

Staff Position:

Qualifications: MBChB MPH FFPHM MD

Staff ID:

School & Division: Clinical School of Medicine

Contact Address: Bag 96. Hobart. 7000.

Telephone: 0362264844 **Email:** Kate.Macintyre@utas.edu.au **(Required)**

A. CO-INVESTIGATOR(S)

i) Given Name Dr Kelly **Surname** **Shaw**

Staff Position: Specialist Medical Officer

Qualifications: MBBS, MPH, PhD FRACGP, FAFPHM

Staff ID:

Contact Address: 3/25 Argyle St, Hobart

Telephone: **Email:** Kelly.shaw@dhs.tas.gov.au **(Required)**

ii) Given Name Dr Stella **Surname** **Stevens**

Staff Position: Associate Head, Postgraduate

Qualifications: **PhD**

Staff ID:

Contact Address: Bag 96. Hobart. 7000.

Telephone: 0362264683 **Email:** Stella.stevens@utas.edu.au **(Required)**

C. STUDENT Investigator(s):

i) Given Name Suzie

Surname Waddingham

Gender: F **Date of Birth:** 17/08/1973 **Preferred Title:** Mr / Ms / Miss **/Mrs** /Dr

Student Number: _____ **Level**: Undergraduate / Honours / Masters / Postgraduate Diploma / **PhD**

Contact Address: Rd, Margate 7054

Telephone: 62 **Email:** Suzanne.waddingham@utas.edu.au

(Required)

ii) Given Name **Surname**

Gender: _____ **Date of Birth:** _____ **Preferred Title:** **Mr / Ms / Miss /Mrs /Dr**

Student Number: _____ **Level**: **Undergraduate / Hons / Masters / Postgraduate Diploma / PhD**

Contact Address: _____

Telephone: _____ **Email** _____

(Required)

4. Is this a student project that requires School approval (eg., program of study approval)? Yes ☐ No ☒

Please note that applications for student projects cannot be accepted until School approval has been granted.

If yes, the project has been:

a) Submitted ☐ *i)* Approved ☐ *ii)* Not yet approved ☐

b) Not yet submitted ☐

5. Approvals from other Departments / Institutions

Does this project need the approval of any institution other than the University of Tasmania (e.g., Department of Education, particular wards in hospitals, prisons, government institutions, or businesses)?

Yes ☐ No ☒

If yes, please indicate below the Institutions involved and the status of the Approval, and attach relevant documentation.

Name of Other Institution(s): Status:

Does this project need the approval of any other HREC? Yes ☐ No ☒

If NO, why not?

If YES, please indicate below which Human Research Ethics Committee, and the status of the application.

Other HREC(s):

Status:

6. Is the investigation a follow-up of a previous study? Yes ☐ No ☒

If yes, what is the ethics reference number of that study? H- - - - -

What was the title of that study?

7. Funding

Under the National Statement (2.2.6) a researcher must disclose:

- the amount and sources or potential sources of funding for the research; and
- financial or other relevant declarations of interest of researchers, sponsors or institutions

Is this research being funded? Yes ☐ No ☒

If yes, please detail amount and source of funds (NS 5.2.7)

If this application relates to Grant(s) and/or Consultancies, please indicate the Title and Grant Number relating to it

If no external funding has been obtained, please indicate how any costs of research will be met:
The majority of cost relating to the project will be associated with time for the teachers to collect the research (the school will be responsible for this) and time that the researcher will be spending on the project..

Do the investigators have any financial interest in this project? Yes ☐ No ☒

If yes, please give details:

8. Keywords Please provide definitions for any technical terms and acronyms

Term	**Lay Explanation**

9. Rationale and Background for the Project:

Has the research proposal, including design and methodology, undergone a peer review process? Yes ☐ No ☒

Please note that applications that are not for student projects are required to have undergone a peer review process prior to submission.

If YES - provide details:

If NO – please explain why:

No formal peer review process has been followed but there has been extensive discussions with the team of supervisors.

Please give a plain English description of the aims of this study

Vision

The vision of the study is to use action participatory research to take students from a Tasmanian primary school on a food journey that will result in a healthy food environment at the school that is utilised and embraced by the students, teachers and parents.

Aims

The aims of this research is to see if this process can result in a school that has students, parents and staff that are committed to a healthy food environment at school, and where this health food environment is seen as 'normal' in the school community.

This includes:

A) A healthy (that is food in line with the Australian Dietary Guidelines with the majority of it prepared onsite) and popular school canteen with healthy options made available every time the canteen is open.
B) The cost of running the canteen to be cost neutral.
C) An increase in consumption of healthy foods by students.
D) Opportunities for students to participate in healthy food preparation and learn where food comes from.
E) Links between the classroom and canteen around learning's about what healthy food is, where does it come from (classroom) and what does it look and taste like (canteen).

In order to achieve these aims I plan to address the following:

- What are student's food preferences for food availability in the school canteen and why are they a preference?
- Can an understanding of food preferences assist to align preferred food availability at the school with Australian Dietary Guidelines?
- What are the barriers to choosing and consuming healthy food?
- Does an understanding of where food comes from and how it is prepared increase the number of healthy food choices made?
- What do teachers want to see available in the canteen?
- Can the cost of running the canteen be maintained while preparing healthy food onsite and having healthy food available every canteen day?

Please give a plain English description of the *justification* for this study.

Background to this project
As an Advanced Accredited Practising Dietitian and through personal networks I was approached by the Holy Rosary Primary school in 2012. The school had already commenced a project internally to improve the food environment within the school. This project will continue with or without my involvement.

I have applied for ethics so that the lessons learned from this project can be disseminated to increase the understanding of the reasons why children make the food choices they do in the school environment. The tools used to collect the data from schools have been developed with school teachers themselves. I have and will not have any direct contact with the students and as far as students are concerned the data collection will be part of usual classroom teacher directed exploration.
As such, there is no additional burden placed on the children, staff, parents or school community

Literature Review
The focus of this study is to explore how to improve eating habits amongst primary school children. This is important because:

1. healthy habits established early in life are known to continue into adulthood.
2. healthy eating habits are a known protective factor for chronic disease for everyone regardless of size
3. obesity is a major public health issue amongst children and adults in Australia with many children of a healthy weight becoming overweight or obese as adults (another reason why it is important to work to improve the healthy eating habits of all children, not just those who are overweight/obese)(1-7).

This project sets out to create a healthy food environment at school through a process that involves the students.

What is the problem and area of focus of this project?

Many children are not eating in accordance to the Australian Dietary Guidelines (ADG's) (8,9). The ADGs are national evidence based guidelines that support health promotion through healthy eating and maximising the intake of highly nutritious foods.

The importance of good nutrition and healthy eating is much broader than a focus on weight alone. The increasing prevalence of overweight and obesity is clearly a major public health issue. However, good nutrition intake is also important and is known to be a protective factor for the prevention of a number of chronic diseases for people of any size (5,7,9-11). The prevalence of chronic conditions across all ages in Australia rising and healthy eating habits formed early in life are more likely to be continued into adulthood (1-5). For these reasons, I plan to focus on healthy eating habits in young children in order to contribute to our knowledge base in this area.

Definitions used in this application

There are a number of terms used to describe what the dietetic profession refer to as 'sometimes foods'. They include; unhealthy foods, foods high in energy, foods with poor nutritional value, 'red' foods, refined and processed foods, food and drinks high in refined sugar and/or fat. I will be referring to all of the above as 'sometimes foods' in this application.

What do we know about healthy eating amongst children in Australia?

It is known that in Australia 'sometimes foods' are being consumed more amongst children than in previous years. Between 1985 and 1995 the energy intakes of school children were shown to have increased significantly (12). More recent evidence shows that children are not consuming recommended intakes of vegetables and fruit (in line with the Australian Dietary Guidelines ADG) and are still exceeding recommendations for 'sometimes foods/drinks' (8,9,13,14). More specifically, a recent study reported that a large proportion of young children did not meet the recommended fruit serves. The same study showed that only about 25% of young children regularly met the recommended serves of vegetables (the percentage was much worse if potato was excluded from the count)(14).

Please list the most relevant and recent literature references, both by the investigator and/or by others, that support the justification for the study.

Bibliography

1. Magarey AM, Daniels LA, Boulton TJ. Prevalence of overweight and obesity in Australian children and adolescents: reassessment of 1985 and 1995 data against new standard international definitions. The Medical Journal of Australia 2001;174(11):561-4.
2. National Health and Medical Research Council, *Food for Health, Dietary Guidelines for Children and adolescents in Australia: A guide to healthy eating*, Department of Health and Ageing, Commonwealth of Australia, 2003.
3. Commonwealth of Australia (2008), *2007 National Children's Nutrition and Physical Activity Survey*. *Main findings.* Accessed at http://www.health.gov.au/internet/main/publishing.nsf/Content/phd-nutrition-childrens-survey-keyfindings.
4. National Health Priority Action Council (NHPAC) (2006), *National Chronic Disease Strategy,* Australian Government Department of Health and Ageing, Canberra. Accessed at www.health.gov.au/chronicdiseasestrategy
5. Mikkila. L., Rasanen. L., Raitakari. OT., Pietinen. P., Viikari. J, *Longitudinal changes in diet from childhood into adulthood with respect to risk of cardiovascular diseases: The Cardiovascular Risk in Young Finns Study*. European Journal of Clinical Nutrition, 2004, 58, 1038-1045.
6. Department of Health and Ageing. (2009). Get Up & Grow: Healthy Eating and Physical Activity Guidelines for Early Childhood Settings. Commonwealth Government of Australia.
7. Nader PR, Stone EJ, Lytle LA, Perry CL, Osganian SK, Kelder S, et al. Three-year maintenance of improved diet and physical activity: the CATCH cohort. Archives of pediatrics & adolescent medicine 1999;153(7):695.
8. Branen L, Fletcher J. Comparison of college students' current eating habits and recollections of their childhood food practices. Journal of Nutrition Education 1999;31(6):304-10.
9. Brown T, Summerbell C. Systematic review of school-based interventions that focus on changing dietary intake and physical activity levels to prevent childhood obesity: an update to the obesity guidance produced by the National Institute for Health and Clinical Excellence. Obesity reviews 2008;10(1):110-41.
10. Carter M, Swinburn B. Measuring the 'obesogenic' food environment in New Zealand primary schools. Health Promotion International 2004;19(1):15-20.
11. Cleland V, Worsley A, Crawford D. What are grade 5 and 6 children buying from school canteens and what do parents and teachers think about it? Nutrition & Dietetics 2004;61(3):145-50.
12. Birch LL. Development of food preferences. Annual review of nutrition 1999;19(1):41-62.
13. Maddock B, Warren C, Worsley A. Survey of canteens and food services in Victorian schools. Nutrition & Dietetics 2005;62(2/3):76-81.
14. Australian Government. National Healthy Schools Project. 2011. Accessed 10/10/12 on http://www.health.gov.au/internet/main/publishing.nsf/Content/phd-nutrition-canteens
15. Queensland Government. Chronic Disease Guidelines.2010. Accessed on http://www.health.qld.gov.au/cdg/ 20/11/12

10. Participants

10. Participants

Number of Participants

How many participants do you intend to recruit? 1 school, 3 classes each class has approximately 25 students

Provide research justification for the number of participants you intend to recruit.

The justification for the number of participants is based on the sample being one of convenience (see below). As this is action participatory research where the majority of data collected is qualitative there is no minimum participant requirement for it to be statistically relevant.

Selection of Participants

Clearly describe the experimental and, where relevant, control groups. Include details of sex, age range, and any special characteristics (ethnic origin, demographic details, health status etc).

Give a justification for your choice of participant group(s).

10. Participants

The experimental group (there is no control group) is made up of 3 classes from a non-government catholic Primary School, (Grade 2, 4 and 6) with approximately 25 children in each class. The age range of the study group is 7-12 years old. The grades have been chosen to obtain views from children across a variety of ages within primary school. Teaching staff felt the concept was beyond students from kinder and prep so those grades have been excluded from the project.

The teachers of each grade will be on the project team and will be collecting the information from participants. One parent will be on the project team and will observe the data collection.

There will also be 1 parent and 1 canteen manager involved in the information collection relating specifically to the canteen sales. The teachers and parent involved are indirect secondary participants as all observation data from them will be collected. The first collection of data will not be identifiable. The second collection of data via video at the Discovery Day will be identifiable; however children's names will not be collected.

The involvement of the students is justified as we want to know their thoughts and preferences about their food environment to get an accurate picture about this rather than filtered perceptions from staff or parents.

Participatory Action Research is an established qualitative research method. Reason and Bradbury (2001) discuss the importance of participation by stakeholders in the reflection and creation of solutions to enable improvement in practice to take place… "action without reflection and understanding is blind, just as theory without action is meaningless"(1).

Key concepts of this type of research include; empowerment, equity and equality, inclusion of local stakeholders as co-researchers, a plan/observe/reflect/act cycle(1-3).

This qualitative research type includes a group with a professional researcher and the community who is seeking to change. Participatory action research involves broad participation by a community group in research that supports action. A problem that the community want to resolve as a group is defined (increase healthy food environment including the canteen) and the team work together to take action and observe/reflect on what has emerged to then plan the next cycle towards the desired outcome. It is powerful because the community (for example students, a school, suburb or workplace) are coming up with the solutions and are driving the direction of the research, this is classic empowerment. The researcher is facilitating the process and everyone takes some responsibility. Team members are just as involved with the development of solutions as the researcher. The cycles build participants confidence and capacity to understand an issue and look for solutions to improve practice (1-3).

The outcome is largely for the community to increase the level of control they have over the improvements they want to see and continue to improve their capacity to do so. This study will seek to show that this type of research is important to create a healthy food environment in a school community.

1. Reason P, and H. Bradbury editor. Handbook of Action Research - Participative Inquiry and Practice: SAGE Publications, London, UK; 2001.
2. Greenwood DaML, editor. Introduction to action research: social research for social change: Sage Publications, USA.; 1998.
3. Services DoHaH. The Action Research and Learning Toolkit. Tasmanian Government; 2012.

Will the project involve any of the following participants? Please indicate how each of the following 'types of research participants' will be involved in the project.

10. Participants

			Primary intent of (or affected by) research	Possible coincidental recruitment	Design specifically excludes
(a)	Pregnant Women?	(NS 4.1)	☐	☐	☐
(b)	Minors, i.e. children under 18 years of age?	(NS 4.2)	☒	☐	☐
(c)	People highly dependent on medical care who may be unable to give consent?	(NS 4.4)	☐	☐	☐
(d)	People with a cognitive impairment, an intellectual disability, or mental illness?	(NS 4.5)	☐	☐	☐
(e)	People who may be involved in illegal activities?	(NS 4.6)	☐	☐	☐
(f)	People in other countries?	(NS 4.8)	☐	☐	☐
(g)	Aboriginal and Torres Strait Islander peoples?	(NS 4.7)	☐	☐	☐
(h)	People who are identifiable by their membership of a cultural, ethnic or minority group?		☐	☐	☐

For each group identified as a “Primary intent of (or affected by) research”, show how your research complies with the relevant chapter of the *National Statement*.

If you answered “Primary intent of (or affected by) research” to (g) you must also attach a statement indicating how Aboriginal and Torres Strait Islander sensitivities will be recognised (see the following publication for guidance: http://www.nhmrc.gov.au/publications/synopses/e52syn.htm)

For each group identified as “Design specifically excludes”, please explain how and why these participants will be excluded.

10. Participants

In accordance to the National Statement under Children and Young People (section 4.2) this research integrates the research values described in this statement. The merit and integrity of the project is maximised by using appropriate methods (as guided by the schools teaching staff and Principal, as well as 3 PhD supervisors). An information/consent sheet will be provided to the school for parents and one to be read out to the participants. Formation of a project team consisting of the Principal, 3 teaching staff and a parent has been formed to plan the project. The involvement of the students is justified as we want to know their thoughts and preferences about their food environment to get an accurate picture about this rather than filtered perceptions from staff or parents. The beneficence has been considered and the teaching staff will collect the data in their usual school surroundings. Risk is negligible as the only foreseeable risk could be inconvenience. However, the teachers from the project team will be collecting data from their usual students, one parent familiar to the students will be observing one phase of the data collection, and the data is being collected during school time and linked with a usual learning opportunity. Finally, the school has standing parental consent and under 4.2.10, however in addition, all parents with children in the relevant classes that will be involved with the project will be asked to provide written consent (see attached).

Recruitment of Participants

How will participants be recruited? From where will your participants be recruited?

Give specific details about how participants will be recruited. Some questions to consider include:

- Are you recruiting through advertisements? If so, indicate where they will be placed and append a copy
- Are you recruiting through 3rd parties like associations, schools or clubs? If so, detail how you will approach the organisations and the process that the stakeholders will use to pass on information to potential participants. Please attach copies of letters of introduction, emails, and telephone preambles if appropriate
- Are the participants University or DHHS staff, or regular patients in a particular clinic? If so, detail how they will be approached i.e. through personal invitation, email etc

The school is already selected through a sample of convenience. The school had heard of my project idea and asked to be the school that participates. The 3 classes were chosen as they cover a range of age groups and their teachers all wanted to participate.
The school is Holy Rosary Primary School, a non-government catholic education institute.

11. Data Source and Identifiability

Does the project involve information sourced from databanks? (NS 3.2) Yes ☐ No ☒

11. Data Source and Identifiability

If yes, state which one(s) and indicate what permission for access is required. Include a description of any conditions of access and attach any relevant approvals.

Is the data collected about individual participants:

a) Non- identifiable?

Non-identifiable data is data which have never been labelled with individual identifiers or from which identifiers have been permanently removed, and by means of which no specific individual can be identified. A subset of non-identifiable data are those that can be linked with other data so it can be known that they are about the same data subject, but the person's identity remains unknown. ☐

b) Re- identifiable?

Re-identifiable data is data from which identifiers have been removed and replaced by a code, but it remains possible to re-identify a specific individual by, for example, using the code or linking different data sets. ☐

c) Individually Identifiable?

Individually identifiable data is data where the identity of an individual can reasonably be ascertained. Examples of identifiers include the individuals name, image, date of birth or address, or in some cases their position in an organisation. ☒

Please note that this question refers to the format in which data is collected and stored, rather than the format in which data is published.

12. Federal Privacy Legislation

The following questions are part of the requirements concerning federal privacy legislation.

(a) Is this project medical research (including epidemiological research?) Yes ☐ No ☒ Go to (b)

If yes, will you require the use or disclosure of information from a Commonwealth agency? Yes ☐ No ☐

If yes, will the information to be disclosed be personal information, i.e. identifiable information? Yes ☐ No ☐

	If yes, will you be obtaining consent from the individuals to whom the information relates?	Yes	☐	No	☐
(b)	Is this Research relevant to public health or safety, or to the management, funding or monitoring of a health service?	Yes	☐	No	☒
					Go to (Question 13)
	If yes, does the research involve the collection, use or disclosure of information from a private sector organisation?	Yes	☐	No	☐
	If yes, will you be collecting, using or disclosing health information	Yes	☐	No	☐
	If yes, will consent be obtained from the individuals to whom the health information relates?	Yes	☐	No	☐

13. Procedures

Describe the procedures to which participants will be subjected or the tasks they will be asked to carry out (please detail exactly what you will be doing).

This study is based on participatory action research methods. All data will be collected from the students, teachers and canteen by school-based members of the project team (Principal, teachers and parent). The researcher will not directly collect data; she will collate and analyse the data only.

The research steps are as follows:

1. Form a project team (the Principal, 3 teachers, a parent an myself).
2. As this is participatory research the school was asked how they thought the data should be collected considering the age and stage of the students/participants. This will be done in 2 stages: A) Each teacher will ask the students a series of questions (see attached) as a group and record the answers on answer sheets to be handed to me for collation and analysis. This includes a visioning question about the canteen. No single student will be named and I will only see a collection of answers from each class. B) All 3 classes will come together for a Discovery Day. This is a usual activity undertaken at the school. The students work in groups and are given a concept and they need to build it/draw it/write about it then present to their peers. The same visionary question about the canteen (from A)) will be presented and the presentation plus comments will be videoed. I will view this at the school for collation and thematic analysis; however I will not be at the Discovery Day.
3. One of the teachers will ask colleagues what there idea of a healthy canteen would look like; this information will be recorded and given to me to collate without any ability to identify individuals.
4. The parent on the project team will spend a day in the canteen to record what is offered,

what is purchased, how the menu items are prepared. This will be recorded and given to me for collation and analysis.

5. Plan to have one day at the school where 1-2 healthier options are offered for lunch on a nominated day. Number of orders made plus cost of preparing healthy options will be collected. This will be organised and conducted by the project team except me. Data and observations will be given to me to collate and analyse
6. I will meet the project team every 1-2 months or after each set of data is analysed to observe and reflect on findings then to plan another action cycle.

Because of the nature of the research, the specific direction of the project will evolve each time the project team meet and reflect on the information collected and observations. All of the notes and observations will be collected, plus any new direction the project takes. This qualitative data will all be used to analyse the food journey and write the report.

The report will be presented to the school and submitted for assessment

14. Data

Will photographs be taken? Yes ☐ No ☒

Will video-recordings be made? Yes ☒ No ☐

Will interviews or focus groups be tape-recorded? Yes ☐ No ☒

If you answered "Yes" to any of the above, please describe the information to be collected, and provide a research justification.

The aim of this project is to go on the students' food journey and establish their interpretation and preferences when it comes to food. The most accurate way to do that is to hear it directly from the students. To maximise the comfort of the students by having familiar people collecting the data while maximising the merit and integrity of the data, the project team decided this would be achieved by video recording the Discovery Day activity presentations without the researcher present. The researcher will view the video at the school.

15. Disclosure and consent:

Does the project collect information from which individual participants can be identified? (NS 2.2) Yes ☒ No ☐

If yes, could the research be conducted using non-identifiable information? Yes ☐ No ☒

Does this project use any form of implicit or passive consent? (NS 2.2.5, 2.3) Yes ☒ No ☐

If yes, please describe how your research complies with the relevant section of the *National Statement*.

Under section 4.2.10 standing parental consent is acceptable research consent when an individual school obtains such consent at the beginning of the school year. This is valid consent as long as the research is conducted in the school setting, parents are notified of the project (information sheet) and research is based on observations in the classroom. This project meets all of the requirements set out in chapter 2 and 4 of the *National Statement*.

Will there be any deception of participations including concealment and covert observation? (NS 2.3.1, 2.3.2) Yes ☐ No ☒

If yes, please describe how your research complies with the relevant section of the *National Statement*.

Describe how participants will consent to participate in this study and how they will be informed of their rights (NS 2.2.1-2.2.7). Attach copies of your Information Sheet and Consent Form (where relevant) or give an explanation of the process by which you will obtain consent. (*Pro formas for Information Sheets and Consent Forms are available on our website at:* http://www.research.utas.edu.au/human_ethics/social_science_forms.htm)

As per above the school has obtained a standing parental consent at the beginning of the year. However, an information/consent sheet will be provided to the school to distribute to relevant parents. .The signed consent form will be collected by the school.

16. Reimbursement

Is any reimbursement, payment, or other reward (outside of course credit) being offered to participants in the study? (NS 2.2.10) Yes ☐ No ☒

If yes, please state what will be offered, what amount will be offered and for what purpose (e.g. a voucher as a prize, reimbursement to cover expenses etc).

17. Intrusiveness

Are there any aspects of the study that are intrusive in areas ordinarily considered personal and private, or that could create apprehension and anxiety for participants? Yes ☐ No ☒

Are you collecting personal details or private information? Yes ☐ No ☒

Is there any kind of dependency relationship between the researcher and any of the participants? Yes ☐ No ☒

If you answered "Yes" to any of the above, please explain in more detail.

18. Potential benefits, risks and harms (NS 2.1)

(a) What are the possible benefits of this research to:

(i) **The participant?**
The possible benefits include being empowered by being involved in a project to create a healthy food environment at school and allow their voice to be heard. Also, as per the rationale, there are several benefits to the participants if their knowledge, acceptance, availability and consumption of healthy food improve.
Additionally, normalising a healthy food environment creates a supportive environment for a child to develop a healthy food habits early in life. This is a benefit as by doing this children are more likely to develop healthy food habits in adulthood which is a protective factor for chronic conditions(4) (which is "estimated to be responsible for more than 80% of the burden of disease and injury suffered by Australians")(15).

(ii) **The wider community?**
The school community will benefit from being part of a healthy food environment as well. The community of all ages will benefit if they gain some knowledge and acceptance of healthy foods, hear about the healthy food environment from their children and if a healthy food environment becomes the 'norm'. This will also be a supportive environment for teachers and parents to make healthy choices.

(b) What are the possible risks or harms of this research to the participants? (NS 2.1)

Could your research evoke anxiety or lead to the recall of painful memories?	Yes	☐	No	☒
Will participants be asked to provide any information or commit any act, which might diminish self-respect or cause them to experience shame, embarrassment or regret?	Yes	☐	No	☒
Will any procedure be used which may have an unpleasant or harmful side effect?	Yes	☐	No	☒
Does the research use any stimuli, tasks, or procedures, which may be experienced by subjects as stressful, noxious, or unpleasant? (NS 2.1)	Yes	☐	No	☒
Will you induce or create physical pain beyond mild discomfort?	Yes	☐	No	☒
Are there any other possible risks or harms of this research to the participants?	Yes	☐	No	☒

If yes, please list other possible risks or harms.

18. Potential benefits, risks and harms (NS 2.1)

If you answered yes to any of the above, please describe how your research will comply with the National Statement (2.1). In addition, please describe the process(es) you will use to manage possible risks (e.g. if interviews may cause distress, provide details of support processes that will be put into place). If participants are to be referred to support services, contact details for these services should be included on the participant information sheet.

19. Monitoring

What mechanisms do you intend to implement to monitor the conduct and progress of the research project?

Please ensure that you include annual reporting to the HREC, and the reporting of any adverse incidents or unexpected outcomes, as required by Section 5.5 of the National Statement.

- Meetings every 4-6 week with my 3 PhD supervisors (as listed under investigators).
- Regular meetings (every 1-2 months) with the project team.
- Annual Reporting to HREC and if required, reporting of any adverse or unexpected outcomes outside of the annual report.
- At this stage all predicted elements of the project are included in this application. However, given the nature of Participatory Action research it is possible other angles or directions could emerge. If this does occur an amendment will be sent to the HREC.

20. Feedback

What feedback will be given to participants?
How will feedback be given? (NS 1.5)

- The results of each data collection step will be presented to the project team and this will include a discussion about what results to share with the students and school community prior to the end of the full project.
- A written report will be presented and given to the school and any community members they would like to include.
- A Thesis will be completed and examined. This will be available to the school if they would like a more detailed report about the project.

21. Data Storage

Please state how and where your data will be stored, for how long it will be retained, and how it will be destroyed.
Address any issues of data security.

Please note: Data must be stored for at least five years beyond the date of publication and then destroyed.
All data must eventually be destroyed, unless explicit consent has been obtained from the participants to archive their data.

- Computer files will be kept on a secured, locked facility within the organisational unit and will require password access and on a secured, regularly backed up university network drive..
- The video DVD will be kept in a locked cabinet in the principal's office at the project school and will be destroyed five years after the project has finished.
- Paper based material relating to the project will be kept in a locked filing cabinet in a supervisor's office within the organisational unit.
- After 5 years the DVD will be cut up, computer files deleted and paper based data shredded.

22. Other Ethical Issues

Are there in your opinion any other ethical issues involved in the research? Yes ☐ No ☒

If you answered "Yes", please explain in more detail.

23. Declarations

a) Statement of Scientific Merit:

The Head of School or the Head of Department is required to sign the following statement of scientific merit:

"This proposal has been considered and is sound with regard to its merit and methodology."

The Head of School's or Head of Department's signature on the application form indicates that he/she has read the application and confirms that it is sound with regard to:

(i) educational and/or scientific merit; and

(ii) research design and methodology.

This does not preclude the SSHREC from questioning the research merit or methodology of any proposed project.

If the Head of School is one of the investigators, this statement must be signed by an appropriate person. This may be the Head of School/Department in a related area or the Dean. The certification of scientific merit may not be given by an investigator on the project.

Name
Position
Signature
Date

b) Conformity with the National Statement

The *Chief Investigator* is required to sign the following statement:

> I have read and understood the *National Statement on Ethical Conduct in Human Research 2007.* I accept that I, as chief investigator, am responsible for ensuring that the investigation proposed in this form is conducted fully within the conditions laid down in the *National Statement* and any other conditions specified by the HREC (Tasmania) Network.

Name Dr Kate MacIntyre
Position
Signature
Date

c) Signatures of other investigators

I acknowledge my involvement in the project and I accept the role of the above researcher as chief investigator of this study.

Name: Dr Kelly Shaw	**Signature:**	**Date:**
Name: Dr Stella Stevens	**Signature:**	**Date:**
Name: Suzie Waddingham	**Signature:**	**Date:**

CHECKLIST	
Please ensure that the following documents are included with your application:	
Information sheet/s (if not attached ensure you have explained why in Section 10)	☒
Consent form/s (if not attached ensure you have explained why in Section 15) N/A	☐
Questionnaires (if applicable)	☒
Interview schedules (if applicable) N/A	☐
A copy of any permissions obtained i.e. Other HREC, Other Institutions (if applicable) N/A	☐
All documents relevant to the study, including all information provided to subjects.	☒
Telephone Preambles (if applicable) N/A	☐
Recruitment Advertisements (if applicable) N/A	☐
Email Contents (if applicable) N/A	☐

TO SUBMIT THIS APPLICATION:

1. **You must email an electronic copy of this application form (can be unsigned) and all supporting documents to:**

   Katherine.Shaw@utas.edu.au

   (Please submit as Microsoft Word documents)
   .pdf versions are acceptable for appropriate documents, eg., posters or advertisements, some questionnaires etc.

2. **A signed copy of this form also needs to be forwarded electronically.**

Has the 'Statement of Scientific Merit' been signed	☐
Have all investigators signed the form?	☐

PARTICIPANT INFORMATION SHEET

Title of the Project

Making healthy choices easy choices – taking students on their own food journey!

Invitation

Your child has been invited to participate in a project that asks children about their food choices.

Holy Rosary School are taking part in this project to understand what foods students would like to have in their school canteen and why they make certain food choices. The project will also explore ways to match these food preferences from students with the Australian Dietary Guidelines.

Holy Rosary Primary School will be running a Discovery Day on October 22, 2013 with three classes, one of which your child attends. This will be part of usual classroom activities. Suzie will film parts of the day, some quotes might be used in the project but NO PICTURES will be used and children will not be identified.

This project is being conducted by Suzie Waddingham, an Advanced Accredited Practicing Dietitian and doctoral student at the University of Tasmania.

What is the purpose of this project?

The overall vision of this project is to create a healthy food environment at Holy Rosary (including a healthy canteen menu). This will involve students and help the school to offer healthier foods. Student's involvement will include them sharing their thoughts about what foods they like, why they like them and what they consider a great canteen to be and why.

Why has the school been invited to participate in this project?

The school approached me as an Advanced Accredited Practicing Dietitian to work with them to create a healthy food environment.

What are the benefits from my child's participation in this project?

The school will receive the services of the Accredited Practicing Dietitian free of charge.

The dietitian will support the canteen to make changes to their menu that is consistent with the Australian Dietary Guidelines.

Students will be involved in the creation of a healthy school food environment that will in turn support them to develop healthy food habits early in life.

What does participation in this project involve?

There is a project team at school that includes the principal Bernie Brooks, Megan Richardson, Liz Mason, Brent Pearce and a parent (Charlotte Hamilton).

Three classes will participate in a Discovery Day. This is a class day and all three grades come together and work together. Students were asked a question as a group and then worked together to draw, make or write something to answer this question before presenting their work to each other. Part of this activity was a video recorded by one of the teachers (this same teacher and the researcher are the only people who will view the video). Suzie Waddingham will accompany the teachers and observe parts of the day. Collecting information this way enables the students to describe their food preferences in their own words amongst peers while in their familiar surroundings. The researcher can then gain an accurate description student's food preferences.

Are there any possible risks from participation in this project?

All information will be treated in a confidential manner. **No student names were collected and no images will be used.** All of the information will be kept in a locked, password access file on Suzie Waddingham's computer and will be securely destroyed five years after completion of the project. The video will be kept in the Principal's office and will be viewed by the researcher twice off site and returned to the school.

This project has obtained approval from the Tasmanian Social Science Human Research Ethics Committee (project number: H0012935). Your child's involvement in this study is voluntary. There will be no consequences if you decide for your child not to participate.

What if I have questions about this research?

If you would like to discuss any aspect of this study please feel free to contact:

- Researcher - Suzie Waddingham Suzanne.waddingham@utas.edu.au. You are welcome to contact me to discuss any issue relating to the research study and a presentation of the findings will be conducted at the end of the study.
- Bernie Brooks, Principal at Holy Rosary – ***Can you please fill in number Bernie***
- Tasmanian Social Science Human Research Ethics Committee - Katherine Shaw, the Executive Officer of the HREC (Tasmania) Network on (03) 6226 2763 or email human.ethics@utas.edu.au. The ***HREC project number: HOO12935***

Thank you for your time.
This information sheet is for you to keep.

Please complete this written consent and return to your child's teacher by ____/____/____

I, _____ give consent for my child, _____ to be involved in this project in accordance to the project as outlined in this information sheet.

Signed _____

Date _____

Appendix 10 - Specific taste investigations

The majority of research with humans on food choice has been conducted among affluent, white, middle-class American and European populations with easy access to unhealthy food, (1) rather than across different types of food environments and people. Hence, research about taste preference has not been exhausted. Some researchers claim that food selection is managed solely by innate, unlearned channels, and nutrient deficiencies would not occur if children are allowed to self-select food (2). Others dispute this theory, known as the 'wisdom of the body,' and claim preferences evolve over time through experience and exposure (1,3). Davis (4), the founder of the 'wisdom of the body' theory, has discussed flaws in her own theory as reported in Strauss's account (2). She emphasised that her cohort had access to inherently healthy food (2). Others agree with her self-critique and support a 'developmental systems perspective' that views taste preference as being the result of both genetic predispositions and environmental factors (1,5). Despite many paediatric text books still proclaiming the 'wisdom of the body' theory holds true, the majority of consensus from a range of researchers is that innate taste preferences and aversions exist prior to any environmental influence and they can all be altered with repeated exposure (1,6-9).

A modern day diet (including access to highly refined foods) and the environment (including excessive food advertising of unhealthy food to children) both influence children's food intakes. Evolution and biology of children also means that they are born with a natural affinity to like certain flavours (8,10). The innate preference to sweet tastes has been researched the most, other tastes investigated include sour, salty, bitter and fat (1,3,8,9). The previous section discussed research across ages about taste preference. This section summarises the information in light of specific tastes with the exception of the umami taste (a savoury taste such as miso), no studies were found that researched umami.

Sweet

From an evolutionary perspective, it makes sense that babies have an innate liking to sweet taste because breastmilk is sweet and high in energy, which is what a baby needs in their rapid time of growth. Taste receptors that recognise sweet foods are present in the mouth,

gut, brain and pancreas (8,10). Sweet tastes lead to both a pleasure and a pain relief response across a range of ages (8,10). In early childhood and during primary school age, there have been several tests to show a preference to sweet foods (1,7,9,11-13). Although the preferred level of sweetness reduces in adolescence to adulthood, there is still evidence that sweet foods have a hedonic appeal to older generations (10). It has been reported that an increase in sugar in processed foods has paralleled an increase in obesity trends (8).

Fat

There was limited literature focusing specifically at the innate taste for fat in younger children. Pleasure and pain relief effects of milk (made up of sweet and fat) have a larger effect with milk, more so than sucrose (sweet) on its own (14). Mammals are born to detect mother's milk to survive, so it makes biological sense because sugar and fat are high-energy nutrients (3,6,8,10). Research has shown globally that there is a preference in the young for high fat foods (5).

Salt

At birth children are either ambivalent to the taste of salt, or reject it (1,13,15). Around 4-6 month, which coincides with the introduction to solids, and beyond, children start to express a liking for the salt taste (1,9,16). This liking for salt continues into adulthood, apparent through the high intake of salt in the Australian diet (17). Highly processed and refined foods are high in salt (18). The easy access and repeated exposure to salt could have increased the liking, which is at odds with healthy eating guidelines.

Sour

Less research has been conducted about preferences around sour foods (19). Research has shown that there is an innate aversion to sour at birth, as tested by observing the amount of sour fluids ingested and facial expressions (13,15,16). It appears that some infants develop a liking for highly sour tastes during childhood and these children tend to be less neophobic (19).

Bitter

Several reports concur that children have an aversion to bitter tastes at birth (1,10,15,16,20). There is a strong consensus that the innate aversion to bitter tastes relates to a protective mechanism against potential toxins, which are mostly bitter in taste (6,10). Children and adults known as PROP tasters, have a sensitivity to the bitter compound PROP (6-n-propylthiouracil) were found to dislike bitter tasting foods (such as spinach, olives, cucumber and broccoli), and preferred milk compared with non-tasters, who preferred cheese (20-22). Children are generally more sensitive to bitter tastes than adults, regardless of being a taster or non-taster (10). A liking for bitter tastes does increase with age, suggesting that repeated exposure can alter taste preferences (6,8,23).

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Appendix 11 – Aspects of Participation Action Research (PAR) explained

PAR is a research methodology with various iterations (224, 225). The responsive nature of PAR means that while there is a systematic and cyclic process (the action cycles), there is no precise research question at the beginning, predictable outcomes or anticipated number of cycles that will be conducted (219, 225). The virtue of PAR is that planning beyond the first action cycle does not occur (219, 224, 225). The flexibility and strength of the methodology in social science is because the research follows the direction of the participant responses, rather than being predominantly researcher driven (219, 224, 225). The effectiveness of the approach, to build new knowledge by increasing an understanding of people's perspectives or to evoke change through working with a target audience, comes from the iterative process of moving through action cycles until data sufficiency is reached (225). A definition of data sufficiency is located at the end of this document.

The systematic approach for conducting PAR, using action cycles, is detailed in Chapter 3 - Methodology (section 3.2, 86) and throughout Chapter 4 - Methods (p 95). More specific detail about the reflective and planning process is provided below.

Reflective and planning processes

Working with the project team as co-researchers with open negotiation is a key part of Action Research. In the reflective stages beyond Action Cycle 1, the researcher liaised with team members when planning an action cycle. The teachers on the project team were seen as the experts with regards to data collection methods that were engaging and familiar to students.

The role of the researcher was facilitation, data, analysis and interpretation, as well as documenting the process through writing the thesis. In this version of PAR, the participatory approach, including observation and reflection during the Discovery Days, occurred through the action cycles as well as at the end of each cycle (219).

Filming and observation during the Discovery Days provided an opportunity for team members to reflect on how the data was collected and make improvements (as described in Chapter 4). The reflection process at the end of each cycle followed the same pattern, the researcher compiled and analysed the data, then produced a summary report to present to the project team. During a face-to-face meeting, the researcher presented the information to the team and these results were openly discussed.

The researcher facilitated the discussion, which formed a round-the-table reflection of the results. Members had the opportunity to raise any questions they felt needed answering or to propose any information needing clarification, which further data collection could provide. The teachers, parent and researcher were also able to reflect on their observations made during the action cycles when they were involved with the data collection days (the team members involved in data collection varied between cycles). Being involved with the data collection resulted in the team members, except the School Principal, to become fully immersed in the PAR process.

The project team were able to reach consensus about what data to collect for all of the action cycles. The teachers on the team provided guidance about the best way to collect data from students. During each reflective meeting after each cycle, the researcher took notes about the discussion and emailed them to the team within a month for confirmation that the discussion and actions from the meeting were correctly interpreted. The researcher then incorporated the actions from the meeting into a plan for the next cycle and emailed the plan to the team for confirmation. Dates and responsibilities for the next action cycle were then decided and the cycle to move to the 'act' stage.

This process was repeated until Action Cycle 5 where the researcher explained how data sufficiency was met after that cycle and the team agreed. Following Action Cycle 5, the researcher completed the analysis and interpretation of results with guidance from supervisors. The researcher has since contacted the school to organise a time for the full results and interpretation to be presented to staff from the school.

Data sufficiency defined

Some might argue the terms of data saturation and data sufficiency are describing the same phenomena. Data saturation generally indicates a stopping point for data collection as no new codes are formed (261, 262). At this stage the data is deemed saturated; a point in which adequate levels of quantity and depth of data is reached (261, 262). Nelson (262) describes data sufficiency as the point when data collection has reached a sufficient depth of understanding to allow the researcher to form a theory or model, and further collection would not contribute to the overall conclusion. According to this definition the data collection described in the thesis reached data sufficiency.